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BAT FALCON
(*Falco albigularis*)

Adult male taken along the Rio Corona near the village of San José de las Flores, 15 miles north of Victoria, Tamaulipas, Mexico, on February 24, 1938. From field sketch in water-color by George Miksch Sutton.

(About one-half life-size)

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THE DISTRIBUTION AND MIGRATION OF THE HUDSONIAN CURLEW

BY P. A. TAVERNER

THE records of the Hudsonian Curlew, *Phaeopus hudsonicus*, show a discontinuous distribution with widely separated migration routes and wintering grounds. The following are the breeding localities that have been definitely reported: Norton Sound, Cape Blossom, Kowak River, Camden Bay (Bent, 1929), Mount McKinley (Dixon, 1938), probably Hooper Bay, Alaska (Conover, 1926), Collinson Point and the Mackenzie delta regions (specimens in National Museum of Canada), and the Anderson River (Preble, 1908) in the Canadian Northwest Territories. There are no reports of the species, breeding or otherwise, between Anderson River and the west coast of Hudson Bay, though the intervening country has been surveyed closely enough that so conspicuous a bird could hardly have been overlooked were it present (Clarke, 1940). It breeds commonly at Churchill (Taverner and Sutton, 1934) and on reasonable evidence can be assumed to do so on Southampton Island at the mouth of the Bay (Sutton, 1932, p. 120). Between these two points along the Bay coast A. E. Porsild noted the species in summer on the Tha-Anna River just north of the Manitoba line (Clarke, 1940). From the southwest shore of the Bay at Severn the Royal Ontario Museum has a July 3 specimen with incubation patches which would seem to indicate local breeding. Northward there are sporadic individual records, but without breeding evidence, from the Melville Peninsula (R. W. Bray, MS) and Arctic Bay, north Baffin Island (specimens in the National Museum of Canada).

Nothing is known of the bird on the east side of Hudson Bay, most of which has received close preliminary examination. It is largely a coastal marine species and is rarely seen on fresh water or away from the sea. The only interior breeding record is in the Mount McKinley region, Alaska, reported by Sheldon (1909) and Dixon (1938). Though it seems to have local, isolated, community-breeding associations rather than a widely connected nesting range, there is no evidence that it breeds in the great *terra incognita* of the interior of the Ungava Peninsula.

On the Pacific side, migrants are not generally common on Bering Sea or southern Alaska coasts except at Sitka and near Juneau where

Willett (1914) and Bailey (1927) report them as regular migrants. There are individual records for Haines and Chilkat Inlet in early June (Bishop, 1900); Atlin, British Columbia, in May and June (Swarth, 1936); Circle, Alaska, and the Ogilvie Range, Yukon Territory, in July (Osgood, 1909). It has not been reported south of these localities until we reach Vancouver Island, where it is more or less regular though not numerous (Brooks and Swarth, 1925). Along the Washington (Bowles, 1918) and California coasts, and in the Sacramento and San Joaquin Valleys its numbers increase (Grinnell, 1915 and 1928). This western group winters from Lower California to Chile (Murphy, 1936, pp. 247, 275). These occurrences seem to indicate a main interior movement through the Yukon, across the base of the Alaska Panhandle and an overseas jump to Vancouver Island whence it follows the coast southward. The spring and fall routes are substantially the same. How the Mount McKinley and Hooper Bay birds go and come is uncertain.

The Atlantic migration is more complicated and follows different routes in spring and fall. The Hudsonian Curlew is powerful on the wing and quite capable of making long sustained flight. Its staple food in the north is the low-lying fruit of the subarctic barrens, particularly the crowberry (*Empetrum nigrum*) on which it gorges. Farther south the fiddler crab of the sand beaches seems to be its main food (Wayne, 1910). Its migrations are probably largely governed by the presence of these or similar foods. Where they are absent along travelled routes the birds are likely to pass over or pay only occasional visits in case of necessity. Under these conditions numbers may pass over uncongenial territory and be noted only occasionally.

The principal data on the eastern migration are:

Northern Labrador.—Several flocks at the mouth of the Koksoak River, but do not halt above Davis Inlet (Turner, 1886). "Not common migrant in late summer, but said to appear annually in small flocks, and often in rather large flocks" (Hantzsch, 1928). That author is a little uncertain as to the species observed but it was undoubtedly the Hudsonian rather than the Eskimo Curlew, the only alternative.

Outer Labrador coast.—"An uncommon late summer and autumn transient in Labrador, passing in small flocks" (Austin, 1932). At Henley Harbor, a few, most numerous about September 1 (Coues, 1861).

Head of James Bay.—"Unknown to me as a breeding bird in the Labrador Peninsula. I have a few fall specimens from the south end of James Bay, that is all" (Todd, letter March, 1941). In 1922, W. G. Walton, for twenty-five years missionary on the east side of James Bay, reports "The Curlew, large and small, left our district about 1885."

Gulf of St. Lawrence.—The writer has found it in considerable numbers (flocks up to 300) in late July and in August on the North Shore from the Moisie River to Natashquan and it undoubtedly occurs farther eastward. "Occurs irregularly in large numbers in Anticosti Island"

(Lewis, 1924). "An abundant August and September migrant in the Magdalen Islands" (Bishop, letter, 1910). Well known to shooters on Miscou Island, who, supported by specimens (National Museum of Canada, fall dates), state that it comes in large flocks, feeding on the tidal flats and the berries of the "barrens". In Prince Edward Island, "A not uncommon summer visitor" (McSwain, 1908).

New Brunswick.—E. F. G. White of Ottawa, a competent ornithological sportsman, reports that he has had excellent Hudsonian Curlew shooting in fall at Tabusintac near the mouth of the Miramache River.

Figure 1. Hudsonian Curlew and nest at Churchill, Manitoba, June 22, 1940. Photograph by Ralph S. Palmer.

A fairly common migrant on Grand Manan with July and August dates given (Pettingill, 1939).

Nova Scotia.—"Hundreds occur locally in Cape Breton and Richmond counties and along the southwest shore of mainland during July and August of each year" (R. W. Tufts, MS, 1937).

Newfoundland.—Reeks (1870) mentions it as occurring along with great numbers of Eskimo Curlew though there has been no verification of these records since. Proper dates of recent observation are lacking but it probably still occurs on the unvisited barrens.

New England and southward.—Along the New England and central Atlantic states coasts from many accounts (Forbush, 1925 and others) it appears to be an irregular fall visitor on occasions when forced in by

stress of weather or other circumstances. From Cape May, New Jersey (Stone, 1938, pp. 416-432) southward it occurs more or less regularly in the spring and fall. A few may winter in South Carolina (Sprunt and Chamberlain, 1931), Florida (Howell, 1932), and Louisiana (Oberholser, 1938), but the bulk seem to pass over the West Indian islands with only occasional stops, to the Guianas and the mouth of the Amazon. On northward migration it seems to follow the same route, but disappears from the coast at about Cape May, New Jersey, reappearing regularly on Lakes Erie and Ontario, the only regular inland record for the species en route to northern breeding grounds. Here, with striking regularity about May 24 each year rather large flocks are briefly seen in passage. In evidence of this, W. E. Saunders writes (March 21, 1941): "It is well known that these birds pass up in considerable numbers each year about May 24. At Komoka (near London, Ontario) six or eight years ago there were several flocks totalling 200 or so. Three or four years ago we saw 75 on Lake Erie at Rondeau ... I think that anyone who will go to Rondeau for a week about then would see a goodly number. I get them on my list every year." Of the Toronto region Fleming (1906) says: "Regular migrant, not common, May 27-July 2," that the old birds return early in July and the young from September 1 to 15, but are very rare. Records supplied by the Royal Ontario Museum of Zoology amply support this statement, citing many May occurrences, often in considerable number, and a few small groups and individuals in July and later. J. A. Munro (in Bent, 1929) reports a flight of passing flocks near Toronto totalling over a thousand birds May 24-26, 1910. E. Beaupre (*loc. cit.*) states that Amherst Island at the foot of Lake Ontario is a favorite crossing place for the species in their northward flight and that May 24 is the date upon which they can be looked for, passing in one large flock. The writer has met with small flocks of the species at Point Pelee at the west end of Lake Erie near the end of May and has observed individuals there in July. There are also circumstantial reports that it regularly occurs in large numbers each May 24 on Middle Island in Lake Erie. West of southern Ontario we have no specific records until we reach southern Manitoba and southern Saskatchewan, where occasional single occurrences are reported. There appears to be a slightly stronger flight of the species through western Alberta, where it seems to be gradually increasing in numbers. Frank Farley (letter, August, 1941) reports their occurring regularly now in numbers near Camrose. He states that this undoubtedly marks a recent increase and is not a case of their having been previously overlooked. All of these records are in the spring and all tend to concentrate about the date of May 24. The frequent repetition of this date at widely spread localities in the migration records of this species shows not only a remarkably constant timing, but the speed and concentration with which the spring passage is made. Northward, occasional records point to the continuation of this flight line up the Mac-

kenzie Valley to the Anderson River breeding grounds.

Elsewhere in the interior, as along the Mississippi Valley fly-way, this curlew appears only as an occasional straggler, though earlier reports suggest that it may at one time have been more common there

Figure 2. The breeding and wintering grounds and migration routes of the Hudsonian Curlew. The broken line traces the hypothetical former migration route, extirpated in recent times.

(Cooke, 1888). However, it is perhaps significant that Cooke did not repeat this statement in his later report (Cooke, 1910). Many of the older writers confused the three curlews and made numerous misidentifications which may be the cause of the discrepancy between past and

present reports, but there may have been a real change in the status of the species in the region. On the gulf coast of Louisiana the species is a more or less regular migrant with lingerers in winter and summer (Oberholser, 1938). We have seen a considerable series of specimens (Fleming collection), and Griscom and Crosby (1925) report a similar group in the Dwight collection all taken from one lot by different collectors on or near May 24, 1902, at Brownsville, Texas. In the same locality Friedmann (1925) calls it "uncommon" and Griscom and Crosby term it "a rare and little known transient." It therefore seems to be of sporadic and irregular occurrence at this point on the Gulf coast, probably off its regular line of migration.

From these data it seems evident that the Hudson Bay birds on leaving their northern breeding grounds make more or less directly for the berry-laden barrens on the Gulf of St. Lawrence. Some, probably the Southampton or northern contingent, strike eastward and are the birds that Turner and Hantzsch report at the north tip of Labrador. Thence they probably fly south over the berry tundras of Ungava. Others, presumably the group from Churchill and west of Hudson Bay, migrate southward to the end of James Bay and thence overland to the same destination. Uniting and moving to Nova Scotia the two groups strike to sea, not making landfall except under stress of circumstances, to the Cape May region, whence they follow the coast to Florida and make the crossing to South America by sustained flight. The spring return reverses the flight as far as Cape May, where it turns inland and by single flight reaches the shores of Lakes Erie and Ontario as described. Here the stop is but momentary and flight is quickly resumed, hence the infrequency with which it is observed. The last lap may be broken at or beyond James Bay or may be continuous to the ultimate individual nesting stations.

There may possibly have been a third flight group up the Mississippi Valley, through Alberta and the Mackenzie Valley to now unoccupied grounds on the coast east of the Mackenzie River. The individuals of this flight may have been nearly extirpated along with the Eskimo Curlew and may now be, as we hope, slowly recovering (see Farley above). This is purely speculative and has only a degree of probability in support.

Thus, we now have two distinct groups of Hudsonian Curlew that in breeding, migration, or wintering, have no or little opportunity for meeting. This provides an isolation that might be productive of subspecific specialization. With this in mind, the writer has critically examined significant samples of the two groups.

Through the courtesy of Mr. L. L. Snyder of the Royal Ontario Museum of Zoology, 68 specimens were borrowed for personal examination and Dr. Josselyn Van Tyne of the University of Michigan Museum of Zoology was kind enough to measure for me some 54 specimens under his charge. These, with those available in the National Museum of

Canada, provided 143 fully sexed and pertinent birds for examination and comparison. These were divided into eastern and western groups as tabulated below. Geographically intermediate specimens were not used in this comparison.

Eastern	Western
Chesterfield Inlet	North Alaska Coast
Churchill	Mackenzie Delta
Labrador	Vancouver Island
Southern Ontario	California
Gulf of St. Lawrence	Oregon
Nova Scotia	Costa Rica
New Hampshire	Ecuador
New York	Peru
Maryland	Chile
Virginia	
South Carolina	
Florida	
Total—97 specimens	Total—46 specimens

A careful comparison of these two groups, sex for sex, revealed no significant differences in either plumage or in measurement of wings or culmen. In the latter case care was taken to include only spring birds, those known to be at least a year old and whose bills could be assumed approximately to have reached mature growth. That these two physically isolated groups of the species had not appreciably diverged suggests that their separation may have been comparatively recent, perhaps within historical times, possibly the result of the extirpation of a connecting population along with the Eskimo Curlew as suggested previously.

Summary

There are two distinct populations of Hudsonian Curlew, breeding, migrating, and wintering on opposite sides of the American continents. A western group migrates up and down the Pacific coast, apparently passing overland across the base of the great Alaskan peninsula to northwestern breeding grounds. The spring and fall routes are substantially alike. The eastern group follows up the Atlantic coast to the vicinity of New Jersey whence it passes inland, stopping regularly, but momentarily, on the lower Great Lakes and thence to breeding grounds west of Hudson Bay. On the return trip birds make their way either by James Bay or through the interior of Ungava to the Gulf of St. Lawrence and to Nova Scotia and then over sea to the New Jersey region and southward along the coast. Though these two populations seem never to have opportunity of meeting and mixing, no racial distinction is detected between them and their separation seems to have been of comparatively recent date. We suggest that there may originally have been a Mississippi Valley group connecting the two breed-

ing areas in the north but which was recently extirpated—perhaps along with the Eskimo Curlew, with which the species seems to have been closely associated in migration.

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BIRDS AT THE EXTREMITIES OF THEIR RANGES

BY MAURICE BROOKS

FOR the biologist a peculiar interest attaches to plants and animals at the extremities of their geographical ranges. These are the pioneers pushing out to conquer new lands, or the remnants of a retreating army fighting a rear-guard action against adverse factors. The ecologist will always speculate as to the limiting factor in the environment, seeking to find and explain the circumstances which permit existence up to, but not beyond, a certain line. The twin dramas of dispersal and occupancy seem very real in such critical situations.

I happen to work in a region where a considerable number of birds are approaching or actually reaching their northern, or their southern, limits. A few species are at their longitudinal limits within the area, but these are not so conspicuous as are those which are at their latitudinal boundaries. Within West Virginia such northern birds as Wilson's Snipe, Saw-whet Owl, Hermit Thrush, Olive-backed Thrush, Nashville Warbler, Northern Water-thrush, Mourning Warbler, Bobolink, Purple Finch, Savannah Sparrow, and Swamp Sparrow reach their known southern limits, while Alder Flycatcher, Olive-sided Flycatcher, Tree Swallow, Red-breasted Nuthatch, Brown Creeper, Winter Wren, Short-billed Marsh Wren, Golden-crowned Kinglet, Henslow's Sparrow, and a number of warblers are approaching such limits. The Black Vulture and Swainson's Warbler are not known to breed farther north, while Bewick's Wren, Carolina Wren, Acadian Flycatcher, Carolina Chickadee, Mockingbird, Blue-gray Gnatcatcher, White-eyed Vireo, Sycamore Warbler, Kentucky Warbler, Summer Tanager, and Bachman's Sparrow are nearing their northern limits. West Virginia, therefore, offers excellent opportunities for observation on the pioneers or the retreating remnants among many bird populations.

After some study of the pertinent ornithological literature I have been impressed by two things; first, that descriptions of bird behavior made at points away from centers of abundance and near the range limits of the species, are often misleading as regards the species as a whole; second, that observations made at these range extremities may, as time goes on, have a peculiar value in tracing the origin and evolution of new races.

Ornithology owes a tremendous debt of gratitude to the scholarship and the literary talents of scientists and bird students in northeastern North America. New England biologists have been fired with enthusiasm and blessed with the gift of words, beyond the rest of us; consequently they have portrayed the bird life around them in such a manner as to make other sections (the near-South, for example) seem ornithologically illiterate. The compiler of a manual turns naturally to those descriptions of a species which seem best to combine scholarship and literary excellence; consequently, and somewhat unfortunately,

many standard works use descriptions of certain species which relate to individuals away from the centers of their abundance. Hence they often misrepresent, or fail to present adequately, the species as a whole.

As a classic example of such descriptions one might take the bulk of the literature relating to the Yellow-breasted Chat (*Icteria virens*). I used to read of (and marvel at) this shy and unapproachable bird, difficult to see, almost impossible to photograph at the nest, the very essence of the elusive. Well, this just wasn't the Chat that I knew down on a bushy West Virginia farm at all. My birds lived in thickets it's true, but when I was picking blackberries the males would often sing in the locust trees above my head, easily observed and not at all shy. The pair that nested just below our house visited our yard regularly, and the male had a favorite singing perch in an apple tree in plain sight from the kitchen window. We found nests rather frequently, and I recall that my father photographed a Chat at its nest before he ever discovered the difficulty of the task. Here, obviously, was a matter which needed explanation.

In recent years I have had opportunities to observe Chats in more northern regions, southern Michigan and central Pennsylvania. To my surprise I have found them in these localities exactly as they are depicted in classic literature, wild and elusive. The explanation is of course that northern observers have judged Chats by the few birds which reach these range extremities, whereas West Virginia, lying much nearer the center of abundance for the species, has a population behaving in more typical fashion. George A. Petrides (*Wilson Bulletin,* 50, 1938:184–189), writing of Chats in and near the District of Columbia, has pointed out the relative tameness of birds which he has observed and photographed, and I do not find the emphasis on shyness in the writings of other southern observers. New England, New York, and Michigan birds, outposts of the species, have apparently overshot the mark, and seem nervous and unapproachable, but these individuals do not typify the species.

Let us imagine a description of the Robin written by one who had seen it only in the Shickshock mountains of the Gaspé. It might read somewhat as follows:

"A resident of the densest fir and spruce forests, where it breeds with Bicknell's and Olive-backed Thrushes. It is excessively nervous and difficult to approach, and can be observed only by the most careful stalking, and the greatest patience on the part of the bird student."

Such a description might be absolutely true-to-life for the region, yet it would scarcely apply to the birds of our dooryards and orchards.

It is respectfully suggested to future authors and compilers of manuals that they make an effort to secure descriptions of the behavior of birds at or near the centers of abundance for the species, even though the words in which these descriptions are couched lack something of literary grace, and even though the authors of the words may be rela-

tively obscure local observers. Science, rather than literature, will be served by such efforts, but the results will certainly come closer to picturing the birds as they are.

It will be unfortunate if, in making the observations and drawing the conclusions above, I leave the impression of having regarded these behavior descriptions made at extremes of range as of little value. Quite the contrary is true.

Without attempting to delve into the tremendously interesting, and tremendously involved, question of the origin of races within a species, or even of speciation itself, it may properly be pointed out, even though it be trite to do so, that isolation of a given segment of the population from the main body seems to be of prime importance in racial separation. When birds (as other organisms) are found at the limits of their ranges the populations often occur in enclaves, disjunct from the remainder of the species' range. A mountain system may form the barrier between populations, bodies of water may intervene, or there may be a broad expanse of land which lacks suitable vegetative cover for a given species. In any event, we have in such situations conditions which seem ideal for the initiation of race separation.

Our ideas of the time required for racial separation are about as hazy as are our concepts of the criteria by which populations may justifiably be separated into races and species.[1] We certainly have little evidence of mutations within recent times which have, in nature, resulted in new bird races or species, nor have we been observing long enough to see clearly the workings of selection.

Realizing the difficulties of measurement and description involved in such situations, it seems perfectly logical to suppose that morphological or physiological differences may not always be the first to appear when racial separation is in process. A new behavior pattern may just as well initiate the modification. This is exactly where the importance of careful field observations made at the range extremes of species comes into the picture. In these variations of behavior may lie the clues to some of the racial separations which are occurring, or which may occur, in these disjunct populations.

The Wilson Ornithological Club has taken a proper pride in its objective—the study of the living bird in the field. What group of observers, then, may more fittingly search out and record for future students of the evolutionary process such detailed, and often seemingly unimportant, bits of information relating to variations in behavior patterns as are to be gathered where birds are reaching their geographical limits?

A few specific observations will give point to these remarks. Let us first consider Bewick's Wren (*Thryomanes bewicki*). This bird is

[1] One rare exception is R. E. Moreau's interesting estimate of the age of certain Egyptian subspecies (*Ibis*, 1930: 229–239).

approaching the northern limits of its range in West Virginia. As many writers have pointed out, it seemingly has had great difficulty in competing with the more aggressive House Wren. Whether or not this competition be the sole cause, Bewick's Wren is today largely absent from the broader river valleys, territory which it once occupied abundantly; local in much of the hill country; and really common only in mountainous sections, where it reaches the fringes of the red spruce forests at 4,000 feet elevation.

Bewick's Wren has shown itself to be a highly plastic species and has thrown off a number of races throughout its range. Although the birds which now nest at the borders of the spruce forest have not been shown to be racially distinct, may it not be that we have here the ideal pattern for a true racial separation? Certainly the environment of the southern highlands is quite different from any occupied elsewhere within the range of the species.

Another bird to watch is Swainson's Warbler (*Limnothlypis swainsoni*). Within recent years observers have learned that this bird, so long associated exclusively with the cane brakes of the south, also occupies a considerable area of the southern highlands in Tennessee, North Carolina, Virginia, and West Virginia. It nests at altitudes up to 3,000 feet or more, and chooses sites that are tangles of rhododendron, mountain laurel, hemlock, and American holly. So far as is known, there are no connecting populations between the coastal or river swamps and the mountains. A more perfect set of conditions for racial separation could scarcely be asked for. We have regarded Swainson's Warbler as a stable species which has not undergone any racial differentiation. However, we have no idea how long this mountain population has occupied its present range. If this be a comparatively recent extension, then we may be witnessing a case where behavior change precedes morphological modification.

In the case of Bachman's Sparrow (*Aimophila aestivalis bachmani*) we have an even more interesting situation. Dr. H. C. Oberholser has examined a number of West Virginia and Pennsylvania birds of this species, and he pronounces them indistinguishable from Carolina specimens. Yet, as I have pointed out in another paper (*Wilson Bulletin* 50, 1938:86–109), the northern birds very seldom build domed or arched nests, but such nests are almost invariable with southern birds. Here is a considerable behavior difference without any observable morphological change to accompany it. It would certainly be rash to say, though, that such a modification will not appear in time.

These are but a few instances. Mr. A. F. Ganier, in a paper before the Wilson Club in 1940, called attention to the morphological intergradation between Yellow-throated and Sycamore Warblers, despite the fact that behavior of the two races, at least in the selection of nesting sites, is quite different. In the southern portion of its range the Black-throated Green Warbler is by no means restricted to coniferous

forests, since it nests in many beech-maple, or oak-hickory, associations, with no conifers nearby. Such instances might be multiplied indefinitely.

Every paleontologist and every comparative anatomist mourns the relative scarcity of bird fossil remains. Yet no one imagines that evolution is finished, or that it is a static process. With every considerable range extension there arises the possibility that birds will be thrown into an environment so new that changes in behavior and changes in morphology may eventuate. We have seen, and marked, many such range extensions. The notes on bird behavior which we take today may guide the thinking of the student of evolution a good many years hence.

Division of Forestry, West Virginia University, Morgantown, West Virginia

Aves, Zoological Record, 77, for 1940 (published in 1941), 60 pp. By W. L. Sclater. 6 s + 4 d postage. Zoological Society of London, Regent's Park, London, N.W. 8.

For the seventy-seventh consecutive year the Zoological Society of London has published its classified index to the ornithological books and papers of the world. As during the first World War, the present volume reflects in its reduced size the unsettled state of our civilization. Only 830 titles are listed, compared with 1,446 for 1939. It should be noted that the former method of cross-indexing has been slightly changed and thereby definitely improved.

The volume was prepared by W. L. Sclater who has carried this burden since R. Bowdler Sharpe passed the duty on to him after preparing the 1908 index. Thus it is Sclater's thirty-second volume!

Ornithologists everywhere should support this important service and improve their knowledge of the subject by buying annual copies of the valuable Aves section.—J. Van Tyne.

SOME ASPECTS OF SPRING WARBLER MIGRATION

BY CYRIL E. ABBOTT

MANY records of migration based upon observation alone are without object. After I had made records of that kind for sixteen years, it occurred to me that much real information might be obtained by using special methods of observation on a single group of birds. This paper is a discussion of the results of applying such a method to warblers.

Unfortunately, frequent migrations of my own made it very difficult to keep accurate and complete records, and the material in this paper represents that extracted from a great deal of chaff. Consequently the results are suggestive rather than final. However, identifications were made as thoroughly and carefully as field conditions would permit, and the notes made at Chicago were checked against the banding records of Mr. Karl Bartel, who was operating a station in the Oak Hill Cemetery where my own observations were made. The remaining data were

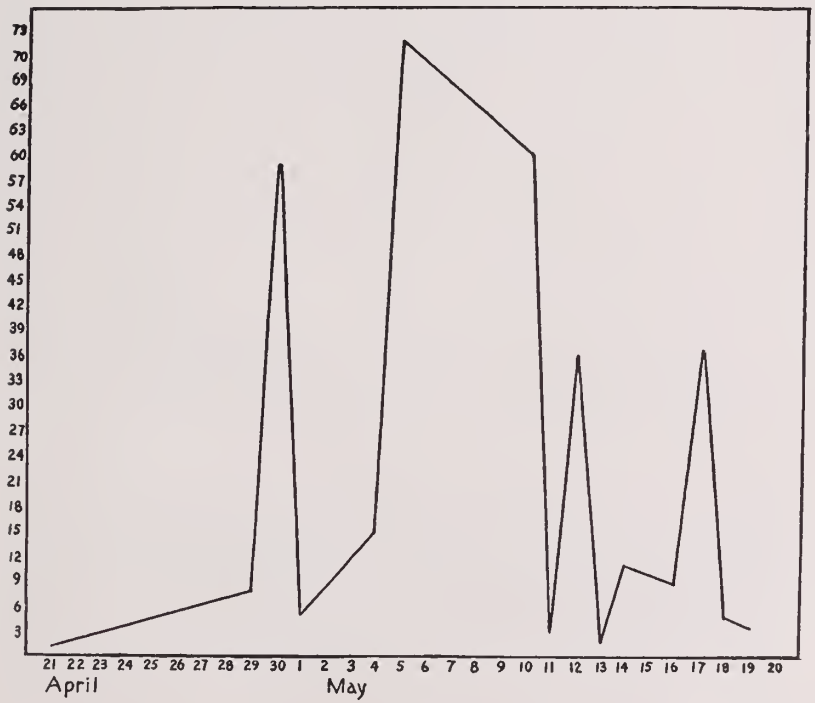

Figure 1. Spring migration of all species of warblers at Chicago in 1934. The column on the left represents numbers of individuals seen.

collected at Searcy during the spring seasons of 1939 and 1940. Searcy is a poor place for such observations because the bulk of the birds apparently passes east of that region. Data collected at Chicago in 1933 and 1935, though corroborative of other material collected, were too fragmentary to record here.

The method employed was extremely simple. Beginning early in the season, and equipped with a pair of binocular field glasses and a pack of 3″ x 5″ cards, observations were begun about 6:00 A.M., and continued for about an hour and a half over an area of approximately half a square mile. In Searcy this included the campus of Harding College and adjacent territory. Each card bore the name of a species of warbler known to occur in the region; whenever a bird was seen, a check mark was made on the appropriate card. Since warblers do a great deal of moving about within small areas, it is easy to recount individuals.

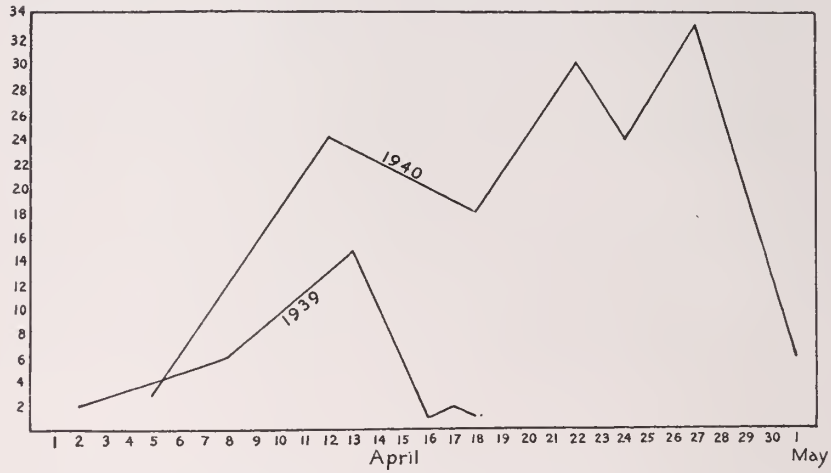

Figure 2. Spring migration of all species of warblers at Searcy, Arkansas, in 1939 and 1940. The column on the left represents numbers of individuals seen.

For this reason count was taken very rapidly in one or two trees and another count made some distance away. It was also necessary to avoid following a group of moving birds to avoid counting them over again. Even with such precautions a wide margin of error was inevitable. But, on the other hand, what was wanted was a series of comparisons rather than exact figures.

That the method was reliable for the purposes intended is indicated by the fact that the results tallied both with more casual observations and with banding records. The purposes were several: to form a general estimate of the numbers of warblers migrating at different periods of the season; to test the wave theory of migration; to compare the

relative numbers of various species; and to determine the migratory peculiarities of different species of warblers.

Graphic representation makes the results evident. For instance, examination of Figure 1 indicates that migration does occur in waves, and that it has a seasonal optimum so far as numbers are concerned. But it indicates further that the peak of migration is skewed toward the latter part of the season. It is evident from Figure 2 that this peculiarity is not accidental, since the data in the latter figure were taken at a different place and different times from those given in Figure 1. This means that there is a tendency for warblers to "pile up." That is to say, they arrive at a given point faster and in greater numbers than they leave it.

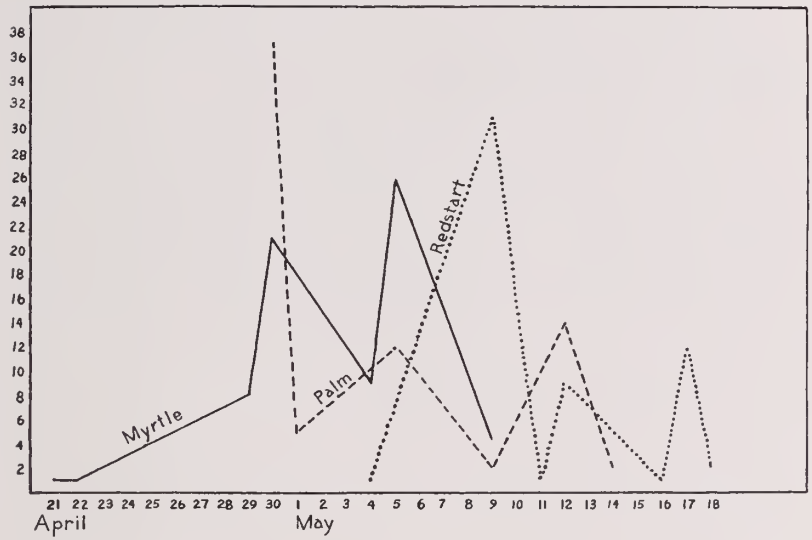

Figure 3. Spring migration of the three most common species of warblers at Chicago in 1934. The column on the left represents the numbers of individuals seen.

The graphs in Figure 3 indicate that, although the migrations of the Myrtle Warbler (*Dendroica coronata*) and Redstart (*Setophaga ruticilla*) overlap, the latter species arrives later and leaves later than the Myrtle Warbler. Yet, curiously enough, the peaks of migration for the two species are close together. My casual observations of other years substantiate this conclusion.

For years before making these observations it was my impression that the Palm Warbler (*Dendroica palmarum*), instead of appearing in increasing numbers, followed by a gradual decline, appears *all at once,*

and then declines in numbers rather rapidly. This is certainly what occurred in Chicago in 1934, as the graph clearly indicates. Very few, if any, members of that species appeared there before April 30.

A frequency histogram of species plotted against numbers of individuals for the year 1934 seems to indicate that as the *total number of individuals declines the variety of species increases*. That is to say, the peak of the migration consists of great numbers of a few species, and as the number of warblers becomes smaller the variety of species increases. Thus, of the 302 warblers observed, 204 (about 67 per cent) belonged to one of three species (Myrtle, Palm Warbler, or Redstart), and these all appeared early in the migration. The remaining 18 species were scattered through the season, but with a greater number of species toward the end of the season.

In conclusion, I believe that these observations indicate that:

1. The warbler migration as a whole occurs in waves, with a distinct peak or seasonal optimum.

2. There is a seasonal optimum for each species.

3. The seasonal optimum for warblers as a group is skewed, indicating a tendency for the birds to accumulate.

4. Some species, such as the Palm Warbler, exhibit individual peculiarities of migration.

5. The greatest variety of species occurs near the end of the migration.

Harding College, Searcy, Arkansas

COMMENTS ON BIRDS AND CODLING MOTH CONTROL IN THE OZARKS

BY JOHNSON A. NEFF

FOR nearly fifty years my parents have engaged in the growing of fruit, largely apples, in the southwest Missouri Ozarks. Thirty years of my life have been spent there in the orchards of the family ranch, with time out for the realization of a graduate degree in horticulture and entomology. Initiated into the pleasures of bird study at a very early age, few opportunities were ever passed by; we were never too busy to stop work to watch the birds that were so abundant in the orchards. And the last ten years, spent in the employ of the U.S. Fish and Wildlife Service, have permitted a wider scope of observation, extending through many States.

The codling moth (*Cydia pomonella*) has long been known as a leading pest of the apple, causing severe losses. In that portion of the Ozarks where I grew up this insect, although long present, was of minor importance until about 1915. During the decade 1915 to 1925 the codling moth became increasingly abundant, and despite the use of every modern method of control, since 1925 has been a devastating pest of most of the Mid-West apple-growing districts.

The eggs of the codling moth are laid on twigs, leaves, or small fruits in the spring. Upon hatching the tiny worms enter the fruits and reach maturity there. Then they leave the fruits, and crawling down the branches they search for secluded niches in the crotches, under bark scales, in the rubbish on the ground, and even under the surface of the soil in any location offering darkened seclusion. Here they spin cocoons, pupate, and finally emerge as adults. Depending upon season and climate, two to four broods per summer may develop; the last remains in the larval stage, hibernating in the cocoon over winter, pupating in the early spring, and emerging as adults about the time the young fruits begin to form.

Among the cultural methods commonly utilized in combating this pest, is the banding of the main trunk and major scaffold branches. With specially designed scrapers the trees are denuded of loose bark. Bands of burlap, red building paper, special chemically treated paper, or even in some instances several thicknesses of newspaper, are placed about the trunk and branches, thus affording a location where mature worms may find protection for hibernation.

The bands are inspected regularly throughout the summer and the larvae or pupae found hibernating under them are killed and the bands replaced upon the trees. In some regions, in addition to bands, it has been found that tightly wadded pieces of newspaper jammed into the major crotches are helpful. These are burned and new wads inserted at each inspection.

Beyond question the leading avian enemies of the codling moth are woodpeckers, chiefly the resident races of the Downy and Hairy Woodpeckers (*Dryobates pubescens* and *D. villosus*). In the Ozarks two decades ago these birds were not abundant in the orchards during summer, but in autumn they moved in from woodland and spent much of the winter hunting codling moth larvae in the orchards. Every scale of bark, every niche and crotch, was inspected time and time again, and the larvae hibernating even under the paper and burlap bands were neatly removed without undue injury to the bands. On several occasions I carefully inspected trees late in the winter which had been severely infested early in the autumn, finding where as many as 300 to 400 larvae had been removed, and frequently failing to find a single remaining worm. Recent visits to the old home ranch indicate that there has been a decided decrease in the number of these birds, probably because of the slow but constant destruction of the small farm woodlots that once furnished ample nesting sites.

During the 'teens and early twenties I maintained in the orchard trees a group of bird boxes, ranging from thirty to more than a hundred. A majority were occupied each year by Bluebirds, and to some extent by titmice and chickadees, and because of the nest-boxes the population of these species was greatly increased about the orchards. When in 1925 the codling moth suddenly reached a serious stage of abundance we found that these nesting boxes and the nesting material therein were favored hibernating spots. During the winter each box could be dismantled, the worms killed, and the old nest destroyed, but this was not possible during the summer nesting season. Consequently the bird-boxes had to go, and with them went the Bluebirds and most of the titmice and chickadees.

This discovery led to examination of other open bird nests found in the apple trees including those of Robins, Brown Thrashers, orioles, and others. The dense construction of the Robin's nest made it a good home for the adaptable apple worm, and on one occasion more than 100 hibernating larvae were taken from a single nest. Now each empty nest is carefully removed from the trees and burned as soon as possible after the birds have left it.

About 1927 we began to find our building-paper bands torn into shreds and often totally freed from the tree, the pieces blown about by the winter winds. This was a new experience, and one that remained unsolved for more than a year. During the next winter season I chanced to pass through an orchard on the morning after a light snowfall. At last the mystery was solved, for Crow tracks led from tree to tree and newly-torn paper bands and parts thereof lay on top of the new snow. Later Crows (*Corvus brachyrhynchos*) were seen actually tearing at the bands. This activity has continued through each winter season since that time. Even the tightly wadded pieces of newspaper are removed from the

crotches of the trees. From the apple culture standpoint this activity of the Crow is not beneficial. It begins in September before the late varieties of apples have been harvested, thus removing the papers before the last of the worms have descended the trunks. At that time the orchardist is very busy and cannot replace the bands until the fruit is picked. By that time the bands or pieces of them are scattered widely over the orchards. Fragments may carry with them some of the worms, for the Crow seems more interested in tearing paper than in searching each piece carefully for the worms it contains. The Crows do eat some of the worms that are exposed to view, but leave others within the paper scraps. Worms so exposed are undoubtedly killed by winter cold or eaten by other birds, but those imbedded in the paper scraps may well survive.

It should be emphasized that the observations here recorded were not in deserted orchards, but in producing ones where modern cultural methods are used as soon as developed. Spraying and other protective practices follow the schedule laid out by a resident state entomologist. Yet under certain favorable climatic conditions, after the best of care, some years as much as 40 per cent to 50 per cent of the apple crop is wormy or defaced by worm "stings" at picking time. With regret we watched the gradual decrease of the Downy and Hairy Woodpeckers in the community as the small farm wood-lots were cut away, for these birds were real benefactors. The cutting of the woodlots has been slow but continued, and no effort has been made to plan for replenishing of the wood supply by farm reforestation. Such a program might one day result in these birds regaining their former numbers.

The use of nest-boxes in the orchard was of course an artificial, man-made attraction, a practice highly recommended by many conservationists. Under the circumstances, however, we were forced to remove them from the orchard for the potential use of the boxes by the codling moth outweighed the benefits received. Bluebirds, although insect feeders, do not appear to feed more than casually on codling moth adults and larvae. Some boxes are still maintained on poles or in trees in pastures at a distance from the fruit trees.

Few fruit growers, even the most radical, would suggest that occupied bird nests in the open fruit trees should be destroyed, although some have learned, as we did, of the hazard of a Robin's nest as a hibernating spot for codling moth larvae. This knowledge dulls somewhat the pleasure that we once obtained from the dense bird population of our orchards. Certainly we must remove and burn every nest as soon as the young desert it.

The band-destroying activity of the Crow adds little to the sum of its already highly publicized economic status, and may well be classed as merely a nuisance activity. Even though the Crows do eat some of the exposed larvae, the effectiveness of our cultural operations would be enhanced if the Crows had not learned to tear away the bands. No matter how much he may like birds, the first endeavor of the farmer is the

earning of a livelihood, and the self-interest of the task demands that to a great extent he consider his own problems before those of others far away. The observations recorded may well raise doubts locally as to the benefits accruing from the presence of certain birds, for many of the species commonly nesting in the orchards of the Ozarks are not highly rated as codling moth destroyers. The observations described illustrate the local contradictions encountered in practical bird economics which may leave even an ardent bird student somewhat at a loss in evaluating the status of his local bird friends.

Wildlife Research Laboratory, Denver, Colorado

Birds in Your Back Yard. By Virginia S. Eifert. Illinois State Museum, Springfield. Popular Science Series No. 2, 1941. 240 pp.; 96 full page plates. $.60 postpaid. (Stamps not accepted).

Too frequently we speak of certain bird publications as *local*, very much as though the term were, in itself, a derogation. Mrs. Eifert, in her recent volume, is concerned primarily with the birds of Sangamon County, Illinois; in that sense her notes are of local interest, but since the species that she pictures and discusses are not, most of them, local in their distribution her work will have value, and create interest, in an area very much more extensive than a single county or state.

In our familiarity with, and dependence upon, colored plates reproduced from paintings, or kodachrome pictures and slides, we are prone to forget how effective black-and-white may be as a medium for presenting bird portraits or studies. Against a gray background Mrs. Eifert has made excellent use of black-and-white to picture more than one hundred and twenty bird species. Her study of the Redwing (page 177) is particularly effective, and she has made excellent selection and use of plant materials in some of her portraits. Many of her warblers are highly lifelike, and the White-throated and White-crowned Sparrows (page 205), are noteworthy.

Chapters on attracting and feeding birds are included; there is a check-list of the birds of Sangamon County; notes on local bird distribution, and a bird calendar, week-by-week, adds to the value of the publication. Teachers throughout the Central States will find it particularly helpful.

Occasional small lapses, such as departures from the A. O. U. Check-list order (see the warblers in the Sangamon County list) may be noted, but the work as a whole is accurately and artistically done. One wishes that other state museums might be able to place such a volume in the hands of its teachers, school children, and bird students.—Maurice Brooks.

NIGHT DESERTION BY NESTING COMMON TERNS

BY NELSON MARSHALL [1]

IN recent years there has been widespread nesting failure among the colonies of the Common Tern (*Sterna hirundo hirundo*) in the island region of western Lake Erie. Though the basic causes remain unknown, a very striking behavior associated with this failure has come to my attention. This is the mass night desertion of the nests by the adults as observed on Starve Island during the past three seasons.

The existence of nesting colonies on Starve and neighboring islands for many years indicates that nesting has probably been successful in the past. The extent of this success is unknown but the descriptions of Lynds Jones (1912) and E. S. Thomas (1927) indicate large colonies with many nests and chicks. A resumé (Table 1) of colony conditions, as observed by C. F. Walker and myself, is presented beyond.

During the course of this study I have received valuable aid from many associates at the F. T. Stone Laboratory. I am very grateful to all of them, especially to Dr. Charles F. Walker for his guidance and to my wife, Grace Terry Marshall, for help in preparing this paper.

The night desertion of the nests as observed on Starve Island is a group behavior phenomenon with characteristics which may be portrayed by an account of my first overnight stay there (July 3–4, 1939).

I entered my canvas blind at 7:30 P.M. The sun started to set at 8:00 P.M. (Eastern Standard Time). Nothing abnormal in nesting behavior was observed until 8:31 when a great majority of incubating terns took flight. They formed large groups, flying back and forth low over the island. As these groups of low-flying birds crossed over the water, they sometimes swooped to within a few inches of the lake level. As they flew back over the island many individual birds hovered over their nests and sometimes returned to them, though sometimes they flew on. This phenomenon lasted for about half an hour. All behavior indicated that the terns were being stimulated on the one hand to depart and on the other to incubate. Birds which had resettled to their nests often took to the air again to join flying groups passing low overhead. Such return and departure of individuals was commonly repeated several times. More and more nests were permanently deserted and the groups of low-flying birds diminished in size as terns made their departure from the vicinity of the island. The result was an almost complete absence, by 9:05 P.M., of adults either on or near the island.

I noted that no phase of this behavior resembled the flights of general alarm that are so frequent in Common Tern colonies. In these "up-flights," to use an expression employed by F. B. Kirkman (1937) in connection with the alarm flights of the Black-headed Gull, the terns fly higher and low-flying groups are lacking.

[1] Contribution from the Franz Theodore Stone Laboratory of Ohio State University, Put-In-Bay, Ohio.

TABLE 1

COMMON TERN COLONIES VISITED IN WESTERN LAKE ERIE *

Starve Island, Ohio	
1938: July 8 and Aug. 3	518 nests (July 8); 11+ young seen (Aug. 3) all able to fly, not necessarily raised here
1939: Repeated observations May 25–Aug. 28	1052 nests (May 25); 182 nests (July 21). Very few eggs hatched; only one chick known to survive
1940: Repeated observations May 21–June 26	295 nests (May 21); 513 nests (May 28); 257 nests, 12 chicks (June 26)
1941: Repeated observations June 15–Aug. 9	90 nests, 2 chicks (June 15); 109 nests, one chick (June 20); 64 nests, 2 chicks (July 10); no nests or young (Aug. 9)
Big Chicken Island, Ontario	
1938: July 24	179 nests, about 350 young (reported by Dale W. Jenkins)
1939: July 8 and 29	485 nests (July 8). No young seen this season; Herring Gulls nested successfully
1940: July 15	No evidence of nesting terns; Herring Gulls nested successfully
1941: July 9	No evidence of nesting terns; Herring Gulls nested successfully (remains of 64 nests still in evidence)
Big Chick Reef and Little Chicken Island, Ontario	
1939: July 8 and 29	102 nests, 2 chicks on the Reef, 163 nests on the Island (July 8). A few Double-crested Cormorants had nested successfully on the Island
1940: July 15	No evidence of nesting terns. 4 Cormorant nests on the island
1941: July 9	No evidence of nesting terns. Herring Gulls had nested successfully (remains of 8 nests on the Reef and 16 nests on the Island still in evidence)
Middle Island, Ontario	
1939: July 13	267 nests
1940: June 27	3 nests, plus evidence of additional nests that had failed
1941: July 12	No evidence of nesting terns
Fish Point, Pelee Island, Ontario	
1938: July 20	26 nests
1941: July 21	121 nests, at least 100 young in various stages of development
The Rattles (2 small islands off Rattlesnake Island), Ohio	
1939: Repeated observations July 21–Aug. 3	Nests common but young very rare
1941: Repeated observations July 5–Aug. 8	45 nests (July 5); 45 nests (July 15); 17 nests, 2 chicks (Aug. 8)

* Unless otherwise stated, no chicks were seen when the nest counts were made.

TABLE 1 (continued)

North Harbor (Island), Ontario	
1939: July 12	26 nests
1941: July 9	18 nests
Middle Sister (Island), Ontario	
1941: July 1	56 nests
Detached Rocks Bordering Green Island, Ohio	
1938: July 13	33 nests
1940: Repeated observations throughout breeding season	18 nests (July 8). No young seen on late July and early August visits
1941: Repeated observations throughout breeding season	14 nests (June 27); 14 nests (July 15); no nests or young (July 31)
Lost Ballast Island, Ohio	
1938: July 31	Evidence that a small colony (10–30 nesting pairs) had failed
1940: June 22	One nest, 2 chicks
1941: July 5	No evidence of nesting terns

From 9:12 to 9:35 I flushed four adult terns, the only birds found remaining on the island. During the night isolated calls were heard from individual birds but none returned. It was a bright moonlight night with moderate winds. The minimum temperature recorded at the Stone Laboratory, a straight line distance of 2⅛ miles from Starve Island, was 70° F.

The first vague signs of dawn came at 3:50 A.M. At 3:55 large, noisy groups of terns commenced to fly low over the water near the island. Soon they flew back and forth over their nests. Many hovered above their nests and eventually alighted. These alighting birds, however, usually returned to the flying groups again, often repeating this several times before settling to normal incubation. The return of the birds in many ways resembled their departure behavior executed in reverse order. At 4:40 this return behavior seemed complete and normal incubation was in progress. Sunrise probably occurred about 5:00 A.M. but the exact time was obscured by clouds.

In the 1939 breeding season I also observed night behavior on Starve Island July 11–12 and 21–22 and the same desertion was found to occur. The departure on July 21 was witnessed from a boat floating 100 yards to the lee of the island, and thus a check was made against the possibility that desertion behavior had been due to my presence. Desertion by the terns nesting on the Rattles, two small islands adjacent to one another, was also ascertained by the absence of adults when we arrived there at 9:15 P.M. on July 21.

During this same season we made attempts to trace the night movements of the Starve Island terns but, although we found that they

vacated the immediate vicinity of the island and we even followed some groups by boat approximately 8 miles from the breeding colony, we learned nothing conclusive about where and how they spend the night.

In 1940, observations were begun earlier in the season. Attempts to study night behavior at Starve Island on May 25–26 and 28–29 yielded confusing results. The terns did not depart at twilight in either instance. On May 25 the terns were flushed by my activities at 9:10 P.M. and did not return (probably until dawn, but I did not stay to prove this). On May 28–29 the colony was not deserted till sometime after 1:00 A.M. and the terns did not return till early dawn at 3:50 A.M. I made another observation by arriving at Starve at 3:00 A.M. on June 1. At that time the terns were present and incubating normally. My arrival caused immediate desertion but the terns returned at the earliest signs of dawn. Later in the season, on June 12–13, 14–15, and 21–22, I noted unquestionable instances of night desertion at Starve Island. The behavior observed on June 12 and June 21 showed that birds do not always follow the set pattern of departure described for July 3, 1939, but may simply desert their nests one by one during the early hours of darkness. On the other hand, I have never found any variation in the early morning arrival behavior. Desertion occurring on June 14–15 was demonstrated by arriving at the island at 3:00 A.M. and finding the colony vacated, a fact which further supports my conviction that desertion is not the result of human intervention.

Visiting the colony in the early morning has proven to be the most practical method of observation. It involved arriving about a half hour before the earliest signs of dawn (about 3:15 A.M.). In the colonies studied, the unconcealed investigator arriving at that hour always caused desertion by whatever terns remained. However, such desertion was not effective for much more than a half hour because deserting terns consistently returned at dawn. Though such a procedure does not enable one to study the nature of the departure behavior, I confined my observations to this method in 1941. Early morning trips to Starve Island on June 20 and July 9 and to the Rattles and Green Island colonies on July 15 showed that, with a few exceptions, the nests had been deserted on these nights.

Even when the great majority of adults desert, a few often remain and continue to incubate. On June 15, 1940, I recorded the temperature of one of these attended nests a few minutes after the adult had been flushed. It was slightly above 80° F., while the temperature of the air and of four deserted nests was 65° F. Night desertion may have exposed the eggs to temperature much lower than this. However, for the dates on which desertion was ascertained, 62° F. (for June 21–22, 1940) is the lowest temperature recorded. Using data presented by R. A. Huggins (1941), one can compare the above temperatures with those normally maintained by the incubating Common Tern, as studied during the daytime. He records an average egg temperature of 96.3° F.

for four nests, while the average air temperature during the four trials involved, each of which lasted six hours, was 82.4° F. The lowest egg temperature recorded by Huggins for the Common Tern is 85.5° F.

It has never been my privilege to observe a successful Common Tern colony during the dark hours and I have found no published accounts of normal night behavior. E. S. Thomas (1927) describes an instance of night desertion about July 22 while his party was actively banding terns at Starve Island. There were some nests present but at this late date most of the young were in the "flapper" stage. Social flights at twilight as displayed by the Common Tern (*Sterna h. hirundo*), the Little Tern (*Sterna a. albifrons*), and the Sandwich Tern (*Sterna s. sandvicensis*) are described by Friedrich Goethe (1939), and M.B. Trautman (1939) adds the Black Tern (*Chlidonias nigra surinamensis*) as another exhibiting an evening behavior pattern of this general nature during the breeding season. Both H. L. Ward (1906) and R. M. Strong (1914) give accounts of comparative inattentiveness of Herring Gulls (*Larus argentatus*) toward their young during the dark hours of the night but these adults did not forsake the general neighborhood.

For information on the night behavior of the Common Tern in successful colonies, I am grateful to Dr. Charles E. Doe, Department of Ornithology, University of Florida, and to Mr. Charles B. Floyd, Secretary of the Northeastern Bird-Banding Association, both of whom have had extensive experience in Cape Cod tern colonies during the hours in question. They have found the Common Tern to be a tenacious incubator during the night, even when the birds were frightened repeatedly by the activities of men in the vicinity.

It is difficult to conceive of predation as a cause for this desertion and nesting failure because of the nature of the behavior involved and because no likely predators are known. The water snake (*Natrix sipedon insularum*) has been common in prosperous tern years as well and there is no evidence that it feeds on eggs or young. I have not seen any mammals, not even rats, on Starve Island. I have observed the Black-crowned Night Heron (*Nycticorax nycticorax*), a species becoming increasingly abundant in western Lake Erie, eating the eggs from unattended nests during the night but I have also seen this bird quickly retreating from the attacks of the defending terns when the colony is well attended. Though Herring Gulls have been nesting in increasing numbers on the Chicken Islands in the past few years, they have not nested on Starve Island and observations yield no evidence that they disturb the terns there.

During the past two years I have kept records of the fish carried to the island in the bills of Common Terns. Such food was composed almost entirely of cyprinids. The most abundant of these, the Lake Shiner (*Notropis atherinoides*), was also found by C. G. Manuel (1931)

to be the most abundant fish in the diet of these terns when he studied their food habits on Saginaw Bay, Lake Huron. It seems probable that an insufficient or a comparatively inaccessible food supply would disrupt nesting activities, as was suggested by O. S. Pettingill (1939) with regard to failures observed in a colony of Arctic Terns (*Sterna paradisaea*). However, it is not possible, at present, to judge whether or not the dietary requirements for normal incubation are adequately met in the waters about these failing colonies.

I doubt whether either adverse weather or human intervention is a factor in the general failure of these colonies. R. S. Palmer's (1938) discussion of severe weather conditions as being disastrous to tern nesting along the Maine coast may have wide application but, during the four years included in this present study, I have observed many cases of failure under what appeared to be ideal meteorological conditions. Similarly, colonies considered, from repeated observations throughout the breeding season, to be quite free from human disturbances have been failures, while, in contrast to this, there is some evidence that terns prospered back in the days when the people of the region made it a practice to collect the eggs for food.

I have been unable to detect anything unusual in the daytime attentiveness of the terns at Starve Island at any time during the nesting season. Adults exchange places at the nest at frequent but irregular intervals. I have noted that sometimes a tern incubates for only a moment; sometimes for well over an hour. It may be quite normal, in the face of certain (in this case unrecognized) adverse conditions, for night incubation to relax even though daytime attentiveness continues. Perhaps this becomes increasingly true as the season progresses. There is evidence that in its earliest form this nest desertion is executed by individuals and later develops into the striking group behavior described, a development which would correlate with the statement made by Palmer (1941, pp. 107, 108) to the effect that "social behavior is most restricted when territories are first defended, but gradually occupies more time from egg-laying onward."

From the records of an extensive banding program at Cape Cod, O. L. Austin, Sr. (1940, p. 160) states that "a successful tern colony is built around an essential nucleus of sexually efficient individuals between four and ten years of age," and he has taken breeding birds as old as sixteen years. Knowledge of such a breeding span enables one to understand this species' ability to continue despite unsuccessful nesting attempts. However, if the conditions described for Starve Island continue and occur in the neighboring colonies, the island region of western Lake Erie cannot be considered a satisfactory breeding area for the Common Tern.

Summary

Night desertion of their nests, a behavior frequently initiated by a distinctive group flight at twilight and lasting till dawn, has been ob-

served on the part of the Common Terns comprising the breeding colony at Starve Island in western Lake Erie. The underlying causes for this lapse in attentiveness, which has been studied during the past three breeding seasons, are as yet unknown. Accompanying it there have been repeated, complete nesting failures, contrasting with reports of past successes.

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DOMINANCE IN WINTER FLOCKS OF CHICKADEES

BY FRANCES HAMERSTROM

THE Black-capped Chickadee (*Penthestes atricapillus*) was chosen for this study * for several reasons: it is common and so tame that it can be baited to feeders near a house, making practicable long hours of winter observation without blinds. It is easily handled and marked, it feeds in flocks in winter, and it fights—sometimes!

Flocks of Chickadees were watched in central Wisconsin from about the first of the year until spring dispersal during three winters, from a different farm house each winter. These houses were surrounded by essentially similar cover types: scrub oak, jack and white pine, and open fields.

The difficulties in gathering dominance data from a wild population were greater than I had anticipated; however, I hardly needed to disturb the birds at all. They were behaving as would any baited or winter-fed flock.

Techniques

All birds were banded with U. S. Fish and Wildlife Service bands, and some were given additional colored celluloid bands. All birds were also marked with colored tail feathers, one or two to each bird. These were either small white feathers dyed bright shades of pink, green, orange, yellow, etc., with Diamond dyes, or naturally distinctive feathers, such as Mallard speculum, Blue Jay wing, or Prairie Chicken breast feathers.

Most feathers had to be cut down in size, and then were glued and tied to the bird's own tail feathers (Edminster, 1938), or were inserted by a modification of imping. One of the birds own tail feathers was cut off near the body, leaving a hollow stub. The tip of the shaft of a colored feather was dipped in Duco Household cement and inserted in the stub.

To keep birds perfectly still while the feather marking was going on, they were stuffed head first into a woolen sock a trifle larger than a mitten thumb.

For the most part, feather marking proved satisfactory. Birds were easily recognized without the disturbance of frequent trapping and handling. Feathers stayed on an average of at least two weeks and sometimes a month, in one instance as long as 70 days, and could be recognized at 15 or 20 yards with eight-power glasses and about half as far with the naked eye. The major disadvantage was that certain colors could be seen more easily than others.

Colored celluloid leg bands were used (in addition to the colored feathers) only in 1939–40, but I found them hard to distinguish.

*Grateful acknowledgement is made to Professor Aldo Leopold and to F. N. Hamerstrom, Jr., for encouragment, criticism, and help in gathering data, as well as to Carl Leopold for data, and to Dr. J. H. Elder for critical reading of the manuscript.

The mechanical disturbance caused by the colored feathers appeared to be very slight, even when a new feather was awry. Bands appeared to annoy the birds more than feathers.

The psychological disturbance is harder to evaluate. That birds can distinguish colors appears to be beyond question (Van Eck, 1939), although I know of no experiments on chickadees or on any closely allied species.

Schjelderup-Ebbe found considerable psychological disturbance in marked domestic chickens. Crawford (1939) summarizes his experience thus: "A very suggestive type of work was begun by Schjelderup-Ebbe on the recognition by group members of individuals belonging to the group. He altered the appearance of hens' heads by covering the comb with a bonnet, or by coloring comb and head feathers with various dyes. In most cases the transformed member of the group was treated as a stranger and was forced to work her way into the closed dominance hierarchy through fighting." Heinroth (1911) suggests that birds recognize each other largely by their faces. It is possible that these hens would have ignored tail markers.

I have imped colored feathers in tails of Chickadees, Blue Jays, White-breasted Nuthatches, House Wrens, and Prairie Chickens, and was unable to notice any change in behavior as a result of wearing a colored feather. These imped passerines never appeared to lose composure for more than a moment. Upon release, Chickadees often gave the *chickadee* call, which seems to express annoyance rather than terror; often they flew straight to a feeder a few feet away and proceeded with their interrupted meal. Dominance in no way appeared to be associated with certain colors: colors used on dominant and on subordinate birds were exchanged without a corresponding change in dominance.

Prairie Chicken (*Tympanuchus cupido americanus*) cocks, on the other hand, when imped on the booming grounds, were often forced to the edge of the ground for two or three days, and showed a loss of prestige and composure. They boomed in a half-hearted way and were easily intimidated by other cocks. I am under the impression, however, that this was due to the shock of recent handling.

Flock Composition

No individual Chickadee appeared to show a preference for feeding with any other individual, and no sign of friendships or the formation of cliques was noticed. One can simply say that birds using the feeder were apt to arrive at the feeder in groups. The members of a group took turns feeding, and left the feeder together. Groups were in no way fixed, varying in size and composition from day to day, sometimes from hour to hour. Wallace (1941), on the other hand found a definite association between certain individuals in his Chickadee flocks.

For convenience sake, I am calling a "flock" all the Chickadees which visited the feeding station during a given winter.

The flocks were not constant; newcomers appeared from time to time and regular feeders disappeared from the stations, sometimes for a week or so and sometimes permanently. It was clear from the scarcity of unmarked birds by the end of the first week of trapping that the regular visitors to the feeders were caught by that time. Thereafter, again judging by the scarcity of unmarked individuals, it was clear that the new birds were being caught and marked within a day or two of their arrival at the feeder. (There was one exception: in 1940 two trap-shy unmarked birds were seen almost daily from February 5 to February 17. On February 17, two unmarked birds were caught and thereafter there were no sight records of unmarked birds until March 2, when No. 8, a new bird, came to the feeder and was marked straightway.)

Size of Flock

I was at first led to the conclusion that size of flock was definitely correlated with severity of winter; the winter of 1936–37 shows the largest flock, the most severe cold, and the deepest snow. However, I now believe that, given reasonably suitable cover, it is the food supply over a number of years which largely determines the size of the flock. At Lenox, Massachusetts, Wallace (1941) sometimes found 40 or more Chickadees coming to one feeder at the Pleasant Valley Bird and Wild Flower Sanctuary in a day. The Sanctuary has had a decade of winter feeding.

Easily obtainable food may, in rural communities, be supplied by deliberate feeding, or by ordinary farm and household practice. The combination of dishwater dumped in the snow and feed scattered for

TABLE 1

Chickadee Flock Size at Rural Stations

Observer, locality	Winter of	Total number banded	Estimated population	Number of years station was occupied by humans		Number of years previously unoccupied by humans	Distance to nearest farm or feeder
				With winter feeding	Without winter feeding		
Leopold, Baraboo	1937–8	7	7	1		4?	2/3 mi.
	1938–9	11	11	2			2/3 mi.
	1939–40	21	21	3			2/3 mi.
Hamerstrom, Hancock	1939–40	8	8	1		9	1/3 mi.
Hamerstrom, Plainfield	1938–9	7	7	1		12?	1/3 mi.
Hamerstrom, Necedah	1936–7	24	24	2	5		1/2 mi.
Ruskowsky, Necedah	1939–40	18 (1 day)	25–30	14+			1/2 mi.

chickens may serve the birds as well as a feeder.

Table 1 gives the total winter Chickadee flocks at a number of rural banding stations in different years. The population figures vary considerably. This seemed astonishing until I noticed that, with the exception of the Necedah stations, they were *growing* populations in territories unoccupied by man during the preceding several winters. The flock size was 7 or 8 the first winter of occupancy, 11 the second, 21 the third, and of the two still older flocks observed, one was known to be larger (24 birds), and the other was estimated at 25-30 birds. It would seem that it takes at least 3 or 4 years to build a flock up to carrying capacity starting from a previously unfed flock.

In other words, increase in size of a winter flock is determined not only by conditions at the moment, but also by what food was available in the preceding few winters. This deals only with upper limits: flocks may be rapidly reduced in size by cutting off the food supply, causing a shift to other feeding places (Butts, 1930).

I do not agree with Butts' conclusions: "It is thought that the feeding stations did not increase the number of birds in the area." However, his work was done where previous feeding and the proximity of human habitations had doubtless already raised the Chickadee population well above unfed levels.

The mechanism by which a flock is built up leaves much room for speculation. Why does it take more than one year to fill up good winter territories near feeders? Chickadees come into a new territory slowly—too slowly to fill it in one year. Individuals may move rather far (I know of one band return of over 50 miles; Maxon, *in litt.*), so it might appear that moving birds should be able to fill new winter territories fairly quickly. However, during winter, when good winter territories would be recognizable as such, the cruising radius is small—usually less than a half mile (Butts, 1930; Aldo Leopold, unpubl.); thus the chances of finding a new territory would be correspondingly few. Furthermore, of the birds which did come in during winter, not all stayed. Plainly, this sort of random movement into a territory could not explain the steady building up in succeeding years.

I suspect that the key lies in tradition. Instead of repeating this random building up from a fresh start, the territory begins its second winter with a nucleus of old-timers,[1] which is added to by the slow accretion just described. It seems likely that this accretion may be made up largely of juveniles. A saturation point is probably reached in time, but I do not know how soon nor at what density.

Thus, Chickadees do not move into a new territory fast enough to fill it in one year, but individuals live long enough (3 to 8 years: Butts, 1930; Wallace, 1941), and return consistently enough to maintain its

[1] A high proportion of banded old-timers have been recovered by banders, Butts (1930). Wallace (1941) recovered 9 out of 10 banded Chickadees at the same station the following winter.

continuity. It seems likely that the habits of old, experienced birds play a strong part in determining the number wintering in a desirable location. Errington (1941) has suggested that a similar mechanism may be effective in determining covey size of Bob-whites from year to year.

Fighting

Chickadees fight, but not under all circumstances. In 1936–37 there were 66 fights (4 between unidentified birds); the flock was large (12 birds, often seen daily), and weather was severe. In 1938–39 not a single fight was observed during the entire season; the flock was small (3 or 4 birds seen daily) and weather was considerably milder. In 1939–40 the weather was again mild for the most part, though not as mild as in the preceding year. The flock was small—more than 3 birds were seen on only one day. Ten fights were seen during the season.

From my own data it would seem that the amount of fighting was proportional to the severity of the weather; however Mary Ruskowsky told me that she saw many fights in her large flock in 1939–40, the same winter in which I saw only 10 in a small flock. The behavior of the Ruskowsky flock would lead one to suspect that the size of the flock has more influence on the amount of fighting than does the weather.

Year	Max. no. birds seen per day	Severity of winter	No. of fights	No. fights per bird per day	Observer
1936–37	12	Very severe	66	.24	F.H.
1938–39	4	Mild	0	0	F.H.
1939–40	4	Moderately mild	10	.13	F.H.
1939–40	19+	Moderately mild	many	?	M.R.

Dominance

The order of dominance for any two birds was clear, but for the flock as a whole it was so complex that attempts to arrange the birds in precise order of dominance failed. As can be seen from Figure 1, dominance is largely uni-lateral. Schjelderup-Ebbe describes this type of dominance for domestic chickens as follows: "The 'peck right' was found to be uni-lateral, i.e., in 1,900 observed instances of pecking, if animal A once succeeded in worsting B, B thereafter was never observed to peck A, except on the rare occasion of a general revolt against the despot" (Crawford, 1939).

Of 76 observed fights in Chickadees in two winters, only one reversal was noticed. In 1937, No. 8 vanquished No. 10 once and was vanquished by No. 10 once; both these birds stood high in dominance. They usually won fights and were very pugnacious.

All the observed fights were about food.[2] About 1,051 feedings were noted during the winter of 1936–37, and of these, 66 involved fights.

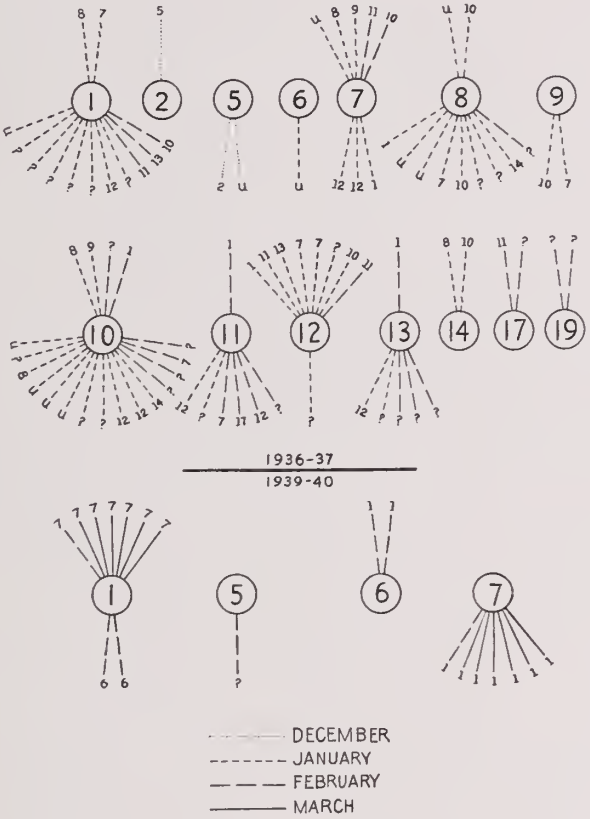

Figure 1. Fighting record.

Each diagram gives the fighting record of the individual within the small circle. Each line extending from the circle represents a fight in which the encircled bird vanquished another if the line extends below, and lost to another if the line extends above.

For example, bird No. 7 in 1936–37 vanquished No. 12 twice and No. 1 once. He was vanquished by No. 8, No. 9, No. 10, and No. 11, and by an unbanded bird new to the station. Unidentified birds are indicated by question marks.

[2] In addition to the fights listed, I saw four contacts of a very different nature: one bird flew at another. These flurries looked like Nice's (1934) description of the nuptial pounce of the Song Sparrow. These occurred on January 17, February 6, and twice on February 7, in 1937. Some of the spring fighting in 1940, though indistinguishable from earlier fighting at the feeder, may have had to do with mating behavior.

In 1939–40, 10 of 417 observed feedings involved fights. Care was taken to distinguish between fights and half-hearted encounters in which the birds did not actually touch each other. The latter were not recorded as fights.

It is reasonable to suppose that subordinate birds would often give way before a fight was precipitated. In fact Odum (1941a) uses this as a criterion of dominance in Chickadees at Rensselaerville, New York. I was unable to distinguish between giving way and peaceable exchange of position at the feeder when one bird was through and another came to take its place, so included only actual fights. Simple feeder replacements without fighting did not appear to be correlated with dominance, perhaps because I was unable to recognize the milder forms of hostility and to separate them from peaceable exchange.

Although all fighting occurred at the feeders, no significant relationship between fighting ability and *number* of feedings was found. The birds that fought most often fed most often, whether they won or lost. In 1936–37,[3] dominant birds fed slightly more often than subordinate birds, and subordinate birds fed slightly more often than the neutrals. In 1939–40, however, of the two birds using the feeder most often, the subordinate No. 1 averaged 5.6 feedings per day to the dominant No. 7's 5.2 feedings per day. There may be an advantage in being a fighter, whether a winner or a loser; on the other hand, the fact that losers fed almost as often as winners may be explainable otherwise:

(1) Birds concentrating near the feeder would tend to feed under crowded conditions and therefore be apt to fight more.

(2) The losers, having had their meals interrupted, may have had to come to the feeder more often than if they had been allowed to feed uninterrupted. Actually, vanquished birds were just as apt to feed immediately after battle as not. Nine times losers left the feeder after fighting and did not return straightway, but in 14 instances losers waited nearby and fed immediately after the winner ceased eating.

There may be a relationship between fighting ability and *amount* eaten at the feeders. In order to get as much to eat as winners, losers should have had to feed more often than winners. This was the case in the small flock in 1939–40. No. 1 at the bottom of the peck order fed more often than No. 7 at the top. In 1936–37, when the flock was large, losers did not feed as often as winners. I suspect that the influence of dominance on opportunities for feeding is negligible in small flocks but increases as flocks become large or the food supply becomes inadequate.

Behavior Toward Newcomers

Intolerance toward newcomers was demonstrated in 1936–37, although only by certain individuals, particularly by No's 10, 8, and 1. Of 66 battles, only 22 were between old-timers (banded birds). After

[3] No. 5 bird and the neutrals, with two exceptions, were in the territory less than five days each, so the data for them are very scant. "Neutrals" are birds which were never seen to fight.

the first week of trapping there was always a great preponderance of banded birds near the feeders, so chance encounters would be more apt to result in fights between old-timers. However, it appears that new birds were more apt to be involved in fights. Moreover, after the first week of trapping, no banded bird ever won a fight until he had been in the territory at least three days.

Further, old-timers appeared to have the advantage in their early encounters with newcomers: banded birds vanquished unbanded birds (newcomers) 9 times and unidentified birds (probably newcomers) 22 times, but were vanquished by unbanded birds only twice, by unidentified birds 5 times. It is likely that many of the unidentified birds were also newcomers, as the presence of colored feathers and bands was easy to detect; still, the fights were so quick that it was sometimes difficult to identify both participants.

Although Odum's (1941b) criteria of dominance differed from mine, he noted a similar attitude toward newcomers. Having moved birds from one flock to another, he observed that the new birds were subordinate to the resident birds the first day; however, they were not driven away. A few of the introduced birds stayed in the new range, displacing some of the resident birds and apparently finding their proper level in the flock.

In 1939–40 practically no intolerance toward newcomers was noticed. Of 10 fights only one was between a banded bird and an unidentified bird, a probable newcomer. This, together with the fact that no fights were seen during the winter of 1938–39, makes it seem likely that intolerance toward newcomers appears only in the larger flocks.

Behavior of Newcomers

Newcomers appeared to be at home in the territory within a few hours and were as apt to win as to lose fights from the second day on, depending upon their individual prowess. However, in 1936–37 no bird arriving after January 21, and in 1939–40 no bird arriving after February 3, ever won a fight. This may have been because the newcomers were subordinate birds which had been forced out of other territories, or it may have been an early spring movement of females into the territory.

At the very first, the behavior of newcomers in the territory was strikingly different from that of the regular visitors, but the difference is difficult to describe. New birds flew to the feeders uncertainly, and showed even more uncertainty in selecting perches and "paths" to and from feeders. I could almost always detect a new bird before I saw that it had not been banded. This uncertainty of behavior may have caused the others to pick on him.

Idiosyncrasies in Feeding

I had wondered whether subordinate birds would be forced to feed earlier or later, i.e., at "inconvenient" times. There were no favorite

feeding hours for any of the birds nor for the flock as a whole. Any bird was apt to feed at any hour of the day, regardless of his position in the hierarchy.

Birds that had been in the territory for some time formed habits which were extraordinarily persistent. For example, it was the custom of No. 1 (1940) to rotate around a piece of suet when feeding, while No. 7 (1940) faced southwest, squatted well down on his tail, and hammered awkwardly away. Upon leaving, No. 7 usually perched on the edge of the tray for a moment, but if he left in a hurry, he touched with his feet the spot where he usually perched and then flew on. I never saw him fly away without either sitting on or touching this spot.

Behavior of a Cripple

No. 8, a crippled bird, appeared on January 5, 1937. One tarsometatarsus had been recently broken near the foot and was badly swollen. He was plainly much handicapped, and was obliged to hang from the feeder (a hanging bag of suet) by one foot and to flutter while feeding. By January 19 the swelling had almost disappeared but he still fed awkwardly. A glance at Figure 1 shows that he stood high in order of dominance and indulged in a more than average number of battles, of which he won 9 of 11. He lost one fight to an unbanded bird and one to No. 10, the best fighter of the whole flock.

The cripple did not appear to be particularly dependent on the feeders, but used them about as often as the average good fighter.

Speculation on the Role of Dominance in the Wild [4]

It is not inconceivable that dominance looms progressively more important as more primitive conditions are reached. Suburban Chickadees, if forced away from the feeder, stand a very good chance of finding a new food supply within a block or two, rural Chickadees, within a mile or two; but Chickadees entirely dependent upon wild food might well be at a grave disadvantage if severe weather not only taxed their strength but also cut off part of their food supply.

The largest flock of Chickadees I ever saw far from human habitation was in the vicinity of a dead skunk which had been partly scavenged by some fairly large animal. The skunk was presumably an easy food supply. In the case of a prolonged ice storm, the small wild foods on which Chickadees usually subsist might be unavailable, but the fairly large animal might continue to scavenge on the carcass, thereby exposing it again to the Chickadees. As long as the carcass lasted, it would serve as a feeding station, and dominant and subordinate birds alike could eat. Once it was gone, all alike would starve.

In such a case dominance would have no survival value. Suppose, however, that by the time the carcass had been finished, a very small

[4] The idea that dominance may have survival value is not a new one. Noble (1939) states: "It is to a fish's advantage to be at the top of the peck order because the dominant fish in the long run secures more food and more mates."

amount of food could be gleaned through cracks in the ice-coated trees—but so little that each "find" was food enough for only a bird or two. The dominants would clearly have the advantage, to the extent that the subordinates might die of starvation and cold.

So dominance might result in forcing vanquished birds away from a limited food supply to their death. Moreover, the resulting mortality might be selective in favor of one sex. Allee (1938) has found that, when the breeding season is not in progress, in some species the males dominate over females, in others the females over the males. The two birds I succeeded in sexing did most of their fighting toward spring, when the male was dominant over the female, however, this female was the winner of two encounters with another bird. I did not determine the sex of any of the regular winter fighters. However, a high proportion of one sex might die, upsetting the sex ratio and thereby slowing up the population recovery for a few breeding seasons. A sex differential in winter-killing of Bob-whites has, in fact, been observed (Hawkins, unpubl.), although its mechanism is unknown.

Conclusions

Chickadees are only momentarily disturbed by banding and imping of tail feathers.

Winter feeding, whether deliberate or not, is apt to increase the size of the flock. At rural feeders the upper limit was not reached until at least the third year after feeding started—possibly not even by then.

Less fighting was observed in small flocks than in large.

Dominance is not linear, but is practically uni-lateral (one reversal in 76 fights).

Poor fighters did not appear to be at a disadvantage in using the feeders; they ate almost as often as good fighters. They may have been forced to come back more often, having had less at each feeding.

A cripple was high in dominance.

Newcomers can be detected by their behavior.

There appears to be some tendency for other birds to pick on newcomers, particularly in large flocks.

Survival value: I found no evidence that the individual's chance for survival is affected by his rank, at least as far as feeding is concerned. Survival value might be influenced by dominance when the flock is very large or food scarce.

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Pinckney, Michigan

THE "INJURY-FEIGNING" BEHAVIOR OF THE FLORIDA NIGHTHAWK

BY IVAN R. TOMKINS

THIS paper presents an account and an interpretation of certain behavior in the breeding adult and the nestling young of the Florida Nighthawk (*Chordeiles minor chapmani*). This particular behavior has been called "injury-feigning" and many other names that are based, in part at least, on the belief that the bird actually pretends to be crippled or injured in order to draw the attention of an enemy away from the eggs or young. During the past few years there has been considerable discussion in our scientific journals of this kind of behavior, and several attempts have been made to explain its meaning.

I believe that the behavior of very young Nighthawks, as described here, throws new light on the pattern followed by the adult female in her display, and allows us a better understanding of its meaning.

The account given here is based on the performance of about twenty-five Nighthawk families observed in the vicinity of Savannah during the past six years.

On the open sandhills along the lower Savannah River there is in summer a large and relatively stable Nighthawk population. The birds nest wherever there is open dry ground, that is, ground fairly clear of vegetation. The species is solitary in nesting. It is an easy bird to observe because it is often quite tame and will allow a close approach before leaving eggs or young.

Pickwell and Smith (1938) have given a good account of similar behavior. Wherever mention is made in this paper of their account, it should be remembered that they wrote of a different species, the Texas Nighthawk (*Chordeiles acutipennis texensis*).

Behavior of the Female

The female Nighthawk, according to my observations, incubates the eggs, and she alone hovers the young or shields them from the hot sun. So it is that only the female has a nest-defense display of this character. Not once have I seen the male incubating eggs, hovering young, or in any marked part of the defense display, other than occasionally chuckling while flying overhead when the young were nearly grown. He usually occupies a perch somewhere within a couple of hundred yards, for he remains with the family group at least until the young are able to fly well.

Pickwell and Smith (1938: 209) report that the male Texas Nighthawk sometimes broods the young at night, and sometimes displays as does the female. J. H. Bowles (1921) reports that the male Pacific Nighthawk (*Chordeiles virginianus hesperis*) fed the young at night.

I have not been able to watch our birds at night, hence am unable to report on that phase of activity.

When the incubating female is first approached, she sits quietly in the natural position, with head neither unduly raised nor lowered, and with eyes nearly closed. (Most of my observations have been in full sunlight). This is the "concealment by self" of Pickwell and Smith. Though this term is probably correct from one viewpoint, the bird actually does nothing. It does not draw its head down, as does the Willet (*Catoptrophorus semipalmatus*), for instance. I have watched Nighthawks at considerable distance, then walked up to them, and have

Figure 1. Tail-depressed flight of the Florida Nighthawk as it leaves the nest.

found the normal incubating position held until I was very close, usually until the bird flushed from the nest. Sometimes as the incubating bird is approached, she will—if a relatively tame bird that allows a close approach—give a throaty chuckle or grunt, perhaps opening her mouth a little. At other times she leaves the nest with no preliminary action at all, the first motion seen being the sudden movement of the wings to lift her from the ground. Perhaps this chuckle or grunt is the "intimidation-display" of Pickwell and Smith. I have found nothing else in our birds which could be so described.

Our Nighthawks, when flushed from eggs or young, go through a performance that seems to vary in different individuals, but when it is divided into parts, the parts themselves are quite definite and stable. Nevertheless, I am still not at all certain that these parts have separate and definite meanings. In other words, possibly the whole flushing display is one performance, varying perhaps according to the degree of timidity of individual birds, or with a distinction lying in certain mechanical limitations, such as the impossibility of behaving the same in flight as on the ground.

For the above reason, and for the purpose of the discussion later, the after-flushing behavior will be divided into three parts.

Figure 2. Extreme display by the brooding female Nighthawk.

I. This is the flight performance of the female leaving eggs or the vicinity of the young. In it she flies directly away with her tail pointed down at the ground and somewhat spread. That is, the tail points almost vertically downward, giving the bird an odd and labored flight. Photographs show the position better than words can describe it (Figure 1).

This distinctive and labored flight is very easily observed. The female uses it at all times when flushed from eggs or young, though a very shy bird may show the tail-depressed flight for only a short distance. Since I first noticed about six years ago that it indicates a brooding bird, I have not observed a single deviation—no bird has flushed in such a situation without showing it in some degree, and no bird has shown it when not engaged in incubating eggs or caring for

young. No male has exhibited it in the slightest degree, as far as I have seen.

If the bird is shy, Action I is the only part of the behavior seen, for she soon abandons the tail-depressed flight and leaves the vicinity. A large percentage of the birds remain near by, and go through all or a part of the rest of the performance.

II. This is the part in which the bird alights some little distance away, spreads wings and tail, and cowers there quivering. If one approaches, she flies off or teeters away with wings and tail still spread. If one moves away, she may follow and repeat.

III. The final part is seen when she opens her mouth wide and hisses, generally turning head or body toward the intruder (Figure 2). A very bold individual will hiss and teeter around, all the time moving closer to the nest, until she settles on eggs or young and is quiet again. In the latter case she may continue to spread wings and tail, or may fold them when walking toward the nest.

Mrs. Nice, in commenting on an earlier draft of this paper, suggested that many birds show three different types of reaction to a nest enemy: They may attack, attempt to intimidate, or go through deflection tactics tending to lure it away, depending on the character of the stimuli offered by the situation and the behavior of the enemy. It has so far proven unsatisfactory to divide the behavior of my Nighthawks thus, though the possibilities presented by studies in that direction are interesting to consider.

Pickwell and Smith found one bird that reacted differently when approached by a human walking upright than it did when he approached on hands and knees. They tried the same experiment on other birds, but without results. After reading their account, an approximation of their two ways of approach was tried on three different Nighthawks with negative results. That is, the birds presented the normal flushing behavior to both methods of approach. At another time one of these three birds was tested by sliding a long slim reed toward it much in the way a snake might approach. The bird remained motionless until the reed nearly touched it, then flushed with the usual tail-depressed flight.

Behavior of Nestling Young

Young birds in the nest have a display which is very similar to Actions II and III of the adult female. When teased, some of them will open their mouths, spread wings (and tail, when partly fledged), and hiss at the intruder, often lunging forward to bite at an extended finger. This reaction was obtained from several young birds, from four or five days old on through the pre-flying period. The pattern was constant for all which began the performance (Figure 3).

Bent (1940: 239) quotes an account by Ernest E. Seton (1890: 554) of similar behavior in the young of Sennett's Nighthawk (*C. m. sennetti*), and Pickwell and Smith reported and photographed it in the species they studied, but not before the birds were twelve days old. The behavior they noticed appeared to be somewhat less than found here in the present species.

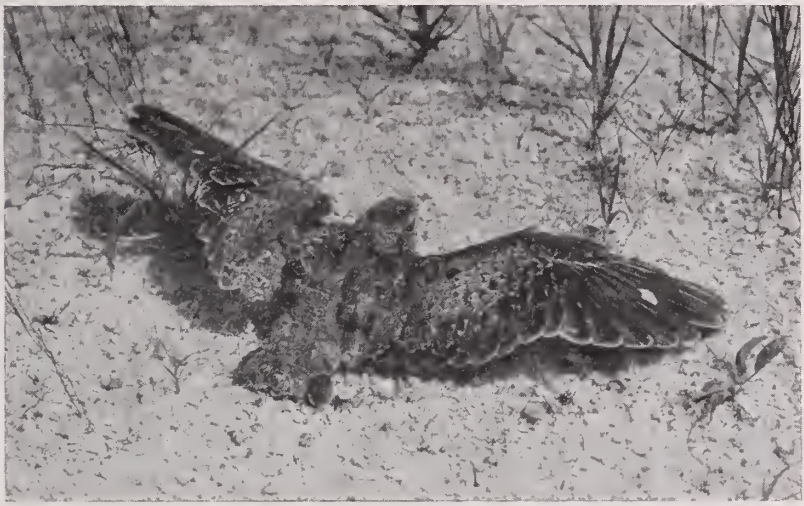

Figure 3. Defense display of the young Nighthawk.

Discussion

The old belief that the display is a theatrical act in which an able bird simulates an injured helpless one, was based on an anthropomorphic concept. It is doubtful whether any scientifically-minded ornithologist of the present day believes in quite this explanation. Yet there is much in the performance to encourage that view.

F. C. R. Jourdain (1936-1937) has reviewed the subject of "injury-feigning," but his account has not been accessible to me. Henry Mousley (1937) has also recapitulated much recent theory in a paper dealing with similar behavior in the Spotted Sandpiper (*Actitis macularia*). Herbert Friedmann's theory (1934) concerning this behavior is that the bird suffers from a conflict between the fear emotion and the reproductive emotion and there results an actual muscular inhibition which makes it impossible for the bird to fly. (See also Stone, 1935).

Mousley considered that the male sandpiper which he observed (this male bird had incubated the eggs and was then caring for the young)

was more likely the victim of an emotional conflict and actually driven crazy or demented, than that he deliberately displayed to attract attention. This is much like the Friedmann theory.

Often it appeared to me that the female Nighthawks used such portion of the display as they wished, that is, it was repeated in part by apparent intention at times. This prevented it being considered as an emotion-conflict. Rather it resembled the "desired reflex action" of Lorenz (1937).

An effort was made to consider the three parts (Actions I, II, and III) and correlate them with the major emotions the brooding bird might be subject to on the approach of an enemy. The result was not a success.

No rational explanation of the display of the adult Nighthawk was found, until the display of the young bird was seen, and the similarity of patterns noticed. The physically weak birds in the nest could not go through all the display of the adults, but the part which they could perform was done in the same manner and under quite similar stimuli. Possibly the tail-depressed flight (Action I) of the adult is also the flight equivalent of the display of the young.

Why should the young bird have a display like that used by the adult? Possibly the question should be turned around to ask why the adult should follow the same pattern as the very young bird. The answer seems to be that the two are identical and are instinctive, a conclusion which is supported by the fact that many different individuals follow the ancestral groove. If it were learned, or an intentional act, there would be much variation.

By acceptance of this conclusion we have two major things involved:

a. An inherited pattern which often to our minds appears like a simulation of being crippled.

b. The use of it by the female Nighthawk in a particular part of the period of reproduction under the combined stimuli of the situation as well as under some volitional control on the part of the individual bird.

This concept of the display has been more satisfactory to me than anything that has been offered. There are many instinctive behavior patterns to be found all through the vertebrate kingdom, and we shall probably never be able to trace the exact origin of this one. It seems to be instinct, pure and simple. "An instinct is a propensity prior to experience and independent of instruction" (Paley).

My thanks are due to Mrs. M. M. Nice for much advice and constructive criticism, and to Dr. J. Van Tyne for his encouragement and assistance.

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GENERAL NOTES

European Widgeon in the Pymatuning Region of Pennsylvania.—Four times during the year 1941, I have observed the European Widgeon (*Mareca penelope*) in the Pymatuning region of Crawford County, Pennsylvania. On each of these occasions the bird seen was a male and invariably it was in the company of Baldpates (*Mareca americana*). All were observed at reasonably close range with eight-power binoculars. The first record was that of a bird seen at a small pool of open water in the ice off the Espyville-Andover causeway on April 3. On April 9, one was present on the marsh at Hartstown. On May 1 there was one near the eastern end of the lake within the Pymatuning Refuge. On October 15 one was observed within the refuge just outside of the town of Linesville. The latter bird remained in the same location and was seen almost daily until October 31.—William C. Grimm, *Linesville, Pennsylvania.*

An Unusual Clutch of Marsh Hawk Eggs.—On April 24, 1941, I discovered a Marsh Hawk (*Circus hudsonius*) nest on the Rose Lake Wildlife Experiment Station area in Bath Township, Clinton County, Michigan. The nest contained one egg. A summary of subsequent observations on the nest follows: April 28, three eggs; May 8, seven eggs; June 2, seven eggs and three young; June 11, three eggs and seven young. The three eggs left proved to be infertile. Thus ten eggs were laid. Neither T. S. Roberts ("Birds of Minnesota," 1, 1936 : 342) nor A. C. Bent (*U. S. Nat. Mus. Bull.* 167, 1937: 82) records nests with more than nine eggs.—Philip S. Baumgras, *Game Division, Michigan Department of Conservation, Lansing, Michigan.*

Great Horned Owl Makes Second Nesting Attempt.—During each of the 1939 and 1940 breeding seasons Mr. John C. Scharff, Superintendent of Malheur Refuge, and the writer noted that incubating Great Horned Owls (*Bubo virginianus*) had been shot on the same nest in a willow tree on the bank of the Blitzen River in the Blitzen Valley, Harney County, Oregon. We thought that perhaps the bird occupying the nest the spring of 1941 might be induced to move to some other locality if robbed of her eggs. Therefore I removed the entire clutch of 4 eggs on March 19. The eggs were saved for laboratory reference material. Three weeks after the eggs were removed a bird was again noted in an incubation posture on the nest and examination of the nest revealed 3 eggs. It was apparently the same bird that had been robbed, as the pair had been noted in the vicinity of the nest during the intervening period. The nest was not bothered further during the season, and as a result a brood of 3 were hatched and reared in the vicinity.

A pair of dark phase Swainson's Hawks (*Buteo swainsoni*) had used this same nest and reared young on it during the 1938, 1939, and 1940 seasons. They occupied the nest during the 1939 and 1940 seasons shortly after the owls had been shot. During the spring of 1941 a dark-phased pair of Swainson's Hawks was noted in the vicinity of this nest on several occasions while the owl was incubating her second clutch, at a time when other hawks were already beginning to nest. They evidently gave up waiting for the nest and built a new one 175 yards down stream from the nest occupied by the owl. There they reared their young. We observed no antagonistic action between these two raptors.—Clarence A. Sooter, *Fish and Wildlife Service, Malheur National Wildlife Refuge, Burns, Oregon.*

The Subspecific Status of Michigan Flickers.—During the course of routine work on the bird collection of the University of Michigan Museum of Zoology, I had occasion to investigate the subspecific status of the Michigan Flickers. It was thought that those breeding in northern Michigan might be *Colaptes auratus borealis,* since Wetmore (Auk, 57: 113, 1940) found that *borealis* bred as far south

as northern Minnesota. However, specimens from the northern part of Michigan are scarcely larger than those from the southernmost counties. Eleven adults from the upper peninsula of Michigan, including Isle Royale, have the wing 149–162 mm. Fifteen from the northern part of the lower peninsula, including the islands in Lake Michigan, also measure 149–162 mm. The wings of twenty-three birds from southern Michigan vary between 146–161 mm. Since these measurements are all well within the range of *Colaptes auratus luteus*, the breeding Flicker throughout the state of Michigan must be referred to that race.

Two autumn specimens are remarkable for their large size. One of them, a male with the wing 171 mm. long, was collected by J. B. Steere at Ionia, Ionia County, Michigan, during October, 1876. The other, also a male, has a wing length of 167 mm. It was taken by J. Claire Wood in Ecorse Township, Wayne County, Michigan, on September 30, 1893. These two birds are as large as breeding specimens of *Colaptes auratus borealis* from northern British Columbia and are without doubt migrants of that race. Other fall and winter specimens examined are all referable to *luteus*.

The Boreal Flicker has not previously been recorded from Michigan.—Pierce Brodkorb, *University of Michigan Museum of Zoology, Ann Arbor, Mich.*

Notes from Northeastern Oregon.—The Blue Mountain region of northeastern Oregon has received relatively little attention ornithologically. The following contributions are offered with the idea of adding to the splendid introductory data contained in Gabrielson and Jewett's "Birds of Oregon" (1940).

La Grande, Union County, in the vicinity of which most of these observations were made, lies at the west edge of the Grande Ronde Valley, at an elevation of 2,700 feet. A tongue of the Upper Sonoran Zone vegetation, characterized by greasewood (*Sarcobatus vermiculatus*) and rabbit brush (*Chrysothamnus nauseosus*), occupies the valley floor where it is not planted to wheat or other crops. Almost as soon as the surrounding hills begin to rise the ponderosa pine (*Pinus ponderosa*) and Douglas fir (*Pseudotsuga taxifolia*) of the Transition zone dominate up to an elevation of 5,000 feet or more, at which point they give place to Engelmann spruce (*Picea engelmanni*) and alpine fir (*Abies lasiocarpa*) of the Canadian Zone which extends up to 6,000 feet, the highest point (Mount Emily) in the vicinity of La Grande.

Columbian Sharp-tailed Grouse (*Pedioecetes phasianellus columbianus*).—In early January, 1940, Dr. Elmo Stevenson, then of Eastern Oregon College, showed me a flock of about a dozen some 25 miles northeast of La Grande, near Elgin. The birds had their headquarters among scattered Douglas firs in a gully surrounded by wheat and other farm land. On February 15, 1941, after an all day search, two other observers and I glimpsed five of these birds flushed just at sunset, in the same vicinity. The farmers of the region have co-operated with the State Game Commission in creating a preserve in an attempt to save this, one of the few remaining bands of Sharp-tails in Oregon.

Catbird (*Dumetella carolinensis*).—On June 29, 1940, I located a pair feeding two young recently out of the nest in a dense thicket near an irrigation ditch in the Valley about five miles southeast of La Grande. After some searching the nest was found in a shrub about five feet above the ground. It contained a punctured Catbird egg which I collected along with the adult male. Several other pairs of Catbirds were located in the vicinity of La Grande. Natives who know the bird say it has occurred here for at least 25 years. Gabrielson and Jewett (*op. cit.*, p. 462) say that it "undoubtedly breeds, although there are no actual breeding records."

Audubon's Warbler (*Dendroica auduboni*).—Judging from last winter and this one, Audubon's Warbler may be expected much later in the fall in eastern Oregon than has previously been supposed. Gabrielson and Jewett (*op. cit.*, p. 504) mention "a single straggling record" for Wasco County, January 2, 1917. Otherwise

their latest date for the region east of the Cascades is October 24. To this I should like to add the following sight records (and the unmistakable call-note heard): November 3, 1940, one at Pendleton; and for La Grande four occurrences—November 11, 1940, one; November 26, 1941, two; December 1, 1941, one; December 30, 1941, one.

Pine Grosbeak (*Pinicola enucleator*).—A female or immature bird was watched at a distance of about twenty feet for about a minute in fir woods at an elevation of about 4,500 feet near Mount Emily on August 3, 1940. On the basis of two specimens taken in worn breeding plumage in September, Gabrielson and Jewett (*op. cit.*, p. 541) state that *P. e. montana* "probably breeds" in the higher Wallowas.

Green-tailed Towhee (*Oberholseria chlorura*).—An adult accompanied by an immature bird seen on a brushy hillside in the lower portion of the Transition zone near La Grande, and adults in song in the springs of 1940 and 1941 indicate that the bird is a regular breeder in Union County. Gabrielson and Jewett (*op cit.*, p. 551) record it from Baker, the county adjoining Union County on the south.

Western Tree Sparrow (*Spizella arborea ochracea*).—On December 8, 1940, I studied a Tree Sparrow for five minutes at close range in a brushy, weedy area in the Valley four miles east of La Grande. Another was seen near Elgin on February 15, 1940. One was seen to fine advantage in the Valley about five miles east of town on December 26, 1941. Gabrielson and Jewett (*op. cit.*, p. 573) record specimens from Baker and Wallowa counties, which adjoin Union County on the south and east, respectively.—A Sidney Hyde, *Eastern Oregon College of Education, La Grande, Oregon.*

A Rock Wren Specimen from Michigan.—My friend, Dr. Max M. Peet, recently remarked to me that he had once seen in Michigan a species of bird which he felt sure was not represented by a Michigan specimen in the University collection. The bird, it turned out, was a Rock Wren which he saw unmistakably from a railway train which was drawing very slowly into the Detroit station. He was familiar with the species in the West and recognized it instantly. The bird was tame and he had a very good look at it for several minutes. This happened in the fall "five or six years ago" but he had not made any note of it because it seemed to him so obviously a stray that had been accidentally transported from the West in a freight car.

This incident caused me to bring out from the collection and restudy a Rock Wren (*Salpinctes obsoletus*) which had long lain there, at first not recognized and later not taken seriously. The specimen came to the University of Michigan Museum of Zoology by gift of Bryant Walker after J. Claire Wood's death in 1916 and was catalogued No. 50838. It is a normal specimen of Rock Wren in somewhat worn and soiled plumage. It is typical of the J. Claire Wood "make" of bird skin and bears the original label with the following data in his handwriting: "Carolina Wren. ♂, Oct. 31, 1910. From pile of railroad ties at D. S. Crossing, Sec. 24, Monguagon Township, Wayne County, Mich." His brother, Walter C. Wood, writes me from Detroit that that entry occurs in the original catalogue now in his possession. The only other birds taken that day were Pine Siskins and a Red-tailed Hawk.

Several facts have a bearing on this erroneous identification of the specimen. J. Claire Wood was not familiar with the Rock Wren and had none in his collection. P. A. Taverner calls my attention to the fact that the Carolina Wren "was just extending into Michigan" at that time and Wood's associates had recently taken specimens. (See *Auk*, 27, 1910:141; *Auk*, 29, 1912:107; *Wilson Bull.*, 24, 1912:129). He was therefore interested in and looking for Carolina Wrens. In the papers of James B. Purdy we find a letter of February 28, 1911 from J. Claire Wood asking for Purdy's Wayne County records of the Carolina Wren, adding that as "soon as I hear from you I will prepare my notes for the Auk." Apparently the note was never published.—Josselyn Van Tyne, *University of Michigan Museum of Zoology, Ann Arbor, Michigan.*

A Bird Housing Project at Hanover, New Hampshire.—During March of 1941, the Junior Nature Club of Hanover constructed fifty bird houses designed for Bluebirds and erected them along the four roads leading out of the village. Members of the club helped to examine the boxes each week until school closed in June and then this inspection was performed by Wendell Cox, one of the more active members, for the remainder of the nesting period.

The boxes were inhabited by Bluebirds (*Sialia sialis*) and Tree Swallows (*Iridoprocne bicolor*). Nest building by the Bluebirds began during the week of April 7 to 12 during which four nests were completed and six others begun. The first Bluebird eggs were found on the inspection of April 23. The first Tree Swallow eggs were found April 30, although this nest was deserted after the laying of the second egg; additional eggs were not found until May 14. The Bluebirds had two periods of nesting: April 23 to May 29, and May 30 to July 31. The one nesting period of the Tree Swallows extended from the week of May 14 to July 1, excluding the first unsuccessful attempt.

The number of boxes occupied by Bluebirds during the first and second nesting periods, and the number of eggs laid during each period, were approximately the same. The percentage of success, however, was much greater for the second period, 91.2 per cent as compared with 65.6 per cent (as based on the number of eggs laid) for the first period. This difference was due primarily to the interference by Tree Swallows which began their nesting about the middle of the first period of nesting of the Bluebirds. There was no interference by English Sparrows. The nesting success of the Tree Swallows was much lower than that of the Bluebirds, being 46.6 per cent.

	Tree Swallow	Bluebird		
		1st Period	2nd Period	Total
Number of nests	16	14	15	29
Number of nests with 2 eggs	1	0	0	0
Number of nests with 3 eggs	0	1	2	3
Number of nests with 4 eggs	5	4	3	7
Number of nests with 5 eggs	7	6	10	16
Number of nests with 6 eggs	3	3	0	3
Total number of eggs	75	67	68	135
Average number of eggs per nest	4.56	4.8	4.5	4.63
Number of sets of eggs unsuccessful	6	3	1	4
Number of young fledged successfully	35	44	62	106
Percentage of success based on number of eggs laid	46.6	65.6	91.2	78.4
Average number of young hatched per nest	2.18	3.1	4.1	3.6

Richard Lee Weaver, *Dartmouth College, Hanover, New Hampshire.*

Orchard Oriole at Hanover, New Hampshire.—While assisting with a bird census by the Dartmouth Natural History Club, Richard DeCou heard the song of an Orchard Oriole (*Icterus spurius*) along the highway one mile south of Hanover on May 15, 1941. He eventually located the bird and verified the identification and then notified me and others who had an opportunity to see and hear the bird. It remained in the vicinity of the poplar trees where first seen until May 23. It was courting a female Baltimore Oriole and was being attacked by a male Baltimore Oriole. We repeatedly saw vigorous fights between the males. The Orchard Oriole followed the pair of Baltimore Orioles about as they collected nesting materials and visited their various perches.

The records for this bird in New Hampshire and Vermont are very few. I know of the following records: two males collected June 1, 1883 at Middlebury, Vermont; an adult and young observed at Brattleboro, Vermont (undated but prior to 1909) according to G. M. Allen (*Occ. Papers Boston Soc. Nat. Hist.*, 7,1909:140); one at Rollinsford, New Hampshire (undated but prior to 1909) G. M. Allen (*loc. cit.*); one second-year male collected by C. F. Goodhue May 14, 1922, in New Hampshire (exact locality not given); and one male identified at the Isles of Shoals on June 17, 1936, by C. F. Jackson.—Richard Lee Weaver, *Hanover, New Hampshire.*

Harris Sparrow at Malheur Refuge, Oregon.—While observing small passerine birds in the vicinity of the headquarters of the Malheur National Wildlife Refuge, Burns, Oregon, on October 26, 1941, I noted two Harris Sparrows (*Zonotrichia querula*) feeding in the greasewood and sagebrush growth just north of the lookout tower. When disturbed, the birds perched on top of a greasewood bush for several minutes. John C. Scharff and Paul T. Kreager also saw these birds. We all observed them in a good light at about 20 yards with seven-power binoculars. Gabrielson and Jewett ("Birds of Oregon," 1940:575–76) list Harris Sparrow as a rare winter straggler and cite only two records in Oregon: at Medford, February 1 and 2, 1912; and at Hillsboro in January and February 1932.—Clarence A. Sooter, *U. S. Fish and Wildlife Service, Burns, Oregon.*

Winter Records of the Slate-colored Junco and Harris Sparrow in Utah.—Heretofore considered accidental, but probably constituting regular winter visitors to Utah are the Slate-colored Junco (*Junco hyemalis hyemalis*) and the Harris Sparrow (*Zonotrichia querula*). Their status as accidental has been based largely on the scarcity of records of the two species, but it appears more likely that few specimens have been collected in the state because of little winter field work having been done. Furthermore, there is the possibility of the two species having been often over-looked since they occur among flocks of other birds.

The Harris Sparrow has been recorded from Utah but twice in the literature. J. S. Stanford (*Proc. Utah Acad. Sci.*, 15, 1938:145) was the first to record the species in the state when he listed a specimen taken April 17, 1937 at Wellsville, Cache County, Utah. A. M. Woodbury (*Condor*, 41, 1939:162) mentions a specimen taken by E. R. Wilson February 9, 1937, at Centerville, Davis County, Utah. Observations by Wilson as reported by Woodbury indicate that Harris Sparrows were common around Centerville from January 1 to March 15, 1937. They were noted there again during the winter of 1937–38 but not in 1938–39. Both of these localities are in central northern Utah.

One of us, Behle, collected a female in the extreme southern part of the state on December 16, 1939, at Santa Clara, 2,800 feet, Washington County, Utah. The bird was taken from a dense river bottom thicket along Santa Clara Creek and was in a small flock of Gambel Sparrows (*Zonotrichia leucophrys gambelii*). The specimen collected was the only one identified in the field, although the concentration of the Gambel Sparrows was so great that other Harris Sparrows might easily have been over-looked. The other of us, Higgins, collected a male in central Utah at Price, 5,500 feet, Carbon County, Utah, December 28, 1941. Three Harris Sparrows were seen at the time in a flock of Juncos of the *Junco oreganus* type. These records, scattered over the state and representing several years span, suggest that the Harris Sparrow is a regular winter visitor in small numbers rather than accidental as Woodbury (*op. cit.*) has stated.

To our knowledge, there are only five formal records of the Slate-colored Junco for Utah based on birds handled, not on field observations alone. Of the latter type of record there are a few others not cited here. H. W. Henshaw (Report Geog. and Geol. Expl. and Surv. West 100th Mer. by George M. Wheeler, 5, 1875:266) first reported a specimen taken at Iron Springs, Iron County, Utah, on October 4,

1872. C. L. Hayward (*Wilson Bull.*, 47, 1935:281) refers to a specimen taken by him November 12, 1932, at Provo, Utah County, Utah. Presnall (*Proc. Utah Acad. Sci.*, 12, 1935:209) mentions banding several winter-taken Slate-colored Juncos in Zion National Park. Stanford (*Ibid.*, 15, 1938:145) cites a female collected October 9, 1937, at North Ogden, in Summit County, Utah. Behle (*Wilson Bull.*, 53, 1941:184) recorded a specimen that was collected 5 miles northeast of La Sal post office, 8,000 feet, San Juan County, Utah, April 7, 1938. Incidentally, the allied race, *J. h. cismontanus* was collected at the same general locality about the same time, so there is some doubt as to the sub-species of certain of the other records mentioned.

As to the new data, Behle, together with John Vasquez, collected a male at Santa Clara, 2,800 feet, Washington County, Utah, December 17, 1939. It was in a flock of Oregon Juncos, samples of which proved to be *J. o. montanus*. Higgins collected a male 3 miles east of Price, 5,500 feet, Carbon County, Utah, December 28, 1940. It, too, was in a small flock of Oregon Juncos. In addition, there is a specimen in the University of Utah collection, the data of which have not been published. It is a male collected by A. M. Woodbury at the junction of Smith-Morehouse Creek and the Weber River, Summit County, Utah, October 10, 1931.

These several records together with the fact that the bird has been reported for several years on the Audubon Society Christmas census for Salt Lake City indicate that this bird likewise is an uncommon winter visitant in Utah.—William H. Behle and Harold Higgins, *Department of Biology, University of Utah, Salt Lake City, Utah.*

EDITORIAL

The frontispiece of this volume introduces to our members the Bat Falcon (*Falco albigularis*), never before adequately figured by an artist familiar with the living bird. The beautiful picture reproduced here is one of the prizes brought back by George Miksch Sutton from the first of his series of expeditions to eastern Mexico.

The Bat Falcon is a conspicuous, widespread species, ranging from Argentina to northern Mexico but because its range falls a few miles short of reaching the borders of the United States, it has been largely neglected by American bird students. However, it is different with those who have watched this handsome hawk racing after the crepuscular bats that circle the Sacred Cenote of Chichen-Itza or have admired it in the hot midday sun darting after swift dragon-flies from the gaunt stubs of the drowned forests of Gatun Lake—to them it is one of the very finest of the whole falcon tribe.

Through the generosity of one of our loyal members the publication of this plate is financed without drawing on either the regular funds of the Club or the special illustrations fund begun by our auction at the Urbana meeting.

The unprecedented growth of our membership list last year reduced the reserve stock of the March, 1941 *Wilson Bulletin* to a rather low point. We therefore solicit the return of extra copies or copies not intended for permanent preservation.

Ornithological News

David E. Davis has gone to Rio de Janeiro for the Rockefeller Foundation to spend a couple of years studying the role of birds as vectors of yellow fever.

F. W. Haecker has been appointed the new editor of *The Nebraska Bird Review*.

The Oologist, one of the oldest American bird journals, announces that it will cease publication with the December, 1941, issue. It was founded in 1884 as *The Young Oologist* and has published 58 volumes. Those wishing to secure back volumes or separate numbers should write promptly to the editor, R. M. Barnes, at Lacon, Illinois.

OBITUARY

Glover M. Allen, mammalogist and ornithologist, died in Cambridge, Massachusetts on February 14, 1942. Although his professional position was that of Curator of Mammals of the Museum of Comparative Zoology, he was one of the most erudite of ornithologists. He was the author of "Birds and Their Attributes," "Birds of Liberia," three books on New England birds, and many important shorter papers. Since January, 1937 he had carried on the high editorial tradition of the *Auk*.

Parish S. Lovejoy, of the Michigan Department of Conservation, died in Ann Arbor, Michigan on January 20, 1942. He was not an ornithologist but he had helped and influenced ornithologists and other zoologists to an extraordinary extent. His fluency with tongue and pen and his brilliant critical ability made him a powerful force for straight thinking, thorough work, and clear writing among workers in our field.

Joseph H. Riley, Associate Curator of Birds of the U. S. National Museum, died December 17, 1941. He had published very extensively for forty years on the taxonomy of birds, especially those of the West Indies and of the East Indies and southeastern Asia.

WILDLIFE CONSERVATION

Present Status of the Ivory-billed Woodpecker

Tbe Ivory-billed Woodpecker bas been very close to extinction for the past twenty years. The remaining individuals and their immediate forebears, although very few and gradually dwindling in numbers, have been able to persist so long because of the continued survival of a few primeval forests where there are enough old and dying trees to supply food to the woodpeckers. In 1939, at the close of the National Audubon Society's research project on the Ivory-billed Woodpecker, the estimated total population of the species was only about twenty-four individuals. These were scattered among remnants of virgin forest in Florida and in Louisiana, not more than six or eight birds being in any one locality. The next few years may decide the fate of the Ivory-bill. The smallness of the nation's reserves of swamp timber, the rising value of lumber, and the present need for many kinds of raw materials may bring destruction to its habitat and thus end tbe species.

There are now only three places which appear to offer any chance for the survival of Ivory-bills. In only one of these—the Singer Tract—are Ivory-bills known certainly to occur, although there is reason to believe that there are a few individuals in the other two. Further, the Singer Tract is now in the process of being destroyed.

The Singer Tract, by all odds the most important remaining Ivory-bill habitat, is an area of virgin timber in northeastern Louisiana, a forest remarkable for its richness of plant and animal life. Ivory-bills have inhabited it for many years; they have been studied and observed there more tban in any other place; and more of tbe birds are there than in any other known habitat. In recent years there have been from six to eight Ivory-bills living in what was left of the virgin timber.

Within the last three or four years a large lumber company acquired control of the tract and began logging the forest. Up to last year most of the cutting was done in parts of the tract not inhabited by Ivory-bills; however, the territory of one pair was logged over, after which the pair disappeared. Last summer logging was started in another part of the forest inhabited by Ivory-bills; it was interrupted by winter rains before so much damage was done as to drive the birds away, but the work will be continued when conditions permit. There is little doubt but that complete logging of the tract will cause the end of the Ivory-bills there, and since the surrounding country is young second-growth forest and cultivated lands, it will doom the woodpeckers to a vain search for suitable food and habitat.

Discussions are being carried on with officials of the company controlling the tract to determine what might be done for the Ivory-billed Woodpecker. Present conditions make it unlikely that much can be done now, but one of the best parts of tbe tract, from the viewpoint of conservation, will probably be the last to be logged, and the condition of the nation may change enough and in time to allow the saving of that part.

The only two other areas where Ivory-billed Woodpeckers may be conserved are both in Florida. One is in the bottomlands of the Apalachicola River and the other is the Big Cypress region of soutbern Florida. Nothing is positively known about the presence of Ivory-bills in these, but the evidence indicates that a few of the birds inhabit both localities. There should be increased interest in these two regions because they are both wilderness areas and unusual babitats for wildlife. Of the two, the Big Cypress is the least likely to be changed by logging or any other activity and so the most likely to be the place where Ivory-bills will survive. It is one of the few remaining primitive areas in eastern United States

and probably will remain so for some time. For that very reason immediate efforts should be made for its preservation, for they will have a better chance of succeeding if carried out before rising prices for timber and other resources make the region profitable to commercial interests.

The future of the Ivory-billed Woodpecker is far from bright, but there is still a chance for its survival if we can plan well enough ahead.—James T. Tanner.

Conservation Notes from Canada

Although bird lovers and ornithologists usually appreciate birds, bird sanctuaries, and bird conservation for good reasons other than the strictly economic, it is undeniable that in advancing conservation work, particularly in obtaining the support of that large part of the population that, without special stimulation, realizes no interest in such activities, sound economic arguments are very useful.

The well-known Canadian Bird Sanctuary at Bonaventure Island and Percé Rock, at the east end of the Gaspé Peninsula, established by both the Dominion Government and the Province of Quebec, consists chiefly of rocky cliffs inhabited by Gannets, Atlantic Murres, Razor-billed Auks, Double-crested Cormorants, Herring Gulls, and other non-game birds, yet annually justifies itself as a valuable

A section of the Gannet colony in Bonaventure Island Bird Sanctuary, Quebec. This photograph, taken in May, 1940, by the Canadian National Parks Service, shows how increase of these birds under protection is causing them to invade the pasture above the cliff.

economic asset because of its attraction for tourists. During 1941 Percé was visited by about 20,000 tourists, of whom about 14,000 circumnavigated Bonaventure Island in local motorboats. Local income derived from this tourist traffic was in the neighborhood of $120,000. Fortunately the birds in this sanctuary, though easily observed, are so protected by the cliffs from close contact with the public that unlimited numbers of well-comported visitors can enjoy them without causing harmful disturbance.

Canadian regulations under The Migratory Birds Convention Act prohibit hunting migratory game birds on baited areas or by the use or aid of baiting. In some places there developed a practice of having grain placed in the water (which is not unlawful) by landowners or those acting for them, with subsequent hunting of ducks by other persons, who, when prosecuted, claimed entire ignorance of the presence of the grain. The Royal Canadian Mounted Police are meeting this practice by searching for grain in suspected places and, if any is found, posting the area for the rest of the season with official signs that read as follows: "Warning. Baiting with grain has been done in this vicinity. Hunting of wild ducks, wild geese, or other migratory game birds on this area or of any such birds attracted to the vicinity by such baiting is unlawful. Unauthorized removal, damaging, or destruction of this sign is prohibited. Penalties, $10 to $300 fine, or imprisonment up to six months, or both fine and imprisonment under the Migratory Birds Convention Act. National Parks Bureau." This method is proving very effective.—Harrison F. Lewis.

Prairie Grouse

"There is some doubt as to the fate of the sharp-tailed grouse and prairie chicken in northern North Dakota. Recently introduced soil conservation practices have done much to improve cover, but the tolerance of these native grouse to the rapidly increasing pheasant and Hungarian partridge populations in this area is yet to be determined. During the hunting season all three birds are frequently flushed from the same aspen-rimmed pot-holes at one time. Whether this close association can successfully exist during the nesting season is a question." (*Wildlife News,* October 15, 1941: 10)

In comparison with other game birds, Prairie Chickens and Sharptails have been given rather little study in the past. Since Pittman-Robertson money has become available, however, there has been a marked increase in the number of states in which research on one or both is under way. The list now includes: Wisconsin, Michigan, Minnesota, Missouri, Illinois, Indiana, Oklahoma, Texas, Nebraska, Kansas, North Dakota, Montana, Colorado, and Utah. Small refuges (but without accompanying research) have recently been purchased by Iowa, Idaho, and New Mexico.

One race of Prairie Chickens—the Heath Hen—has become extinct; the Attwater Prairie Chicken is now limited to about ten per cent of its former range and is in critical condition numerically; the Greater Prairie Chicken has lost most of the southern part of its original range, and has been displaced to the north. The Lesser Prairie Chicken occurs now in only about half of its original range. Sharp-tails have fared considerably better, but show an even more complete loss of the southern part of their range. One race, the Columbian Sharp-tail, is threatened with extinction.

Both Prairie Chickens and Sharp-tails, then, have suffered great loss of range; both have nearly disappeared from the southern parts of their original ranges, and have been displaced to the north; each is now tremendously reduced in numbers. In each case, the most obvious cause of the decline has been the destruction of habitat. Over-hunting has also contributed. Habitat destruction on the original

range was accomplished by agricultural development; the removal of agriculture and subsequent brush invasion have now taken away much of the acquired range to the north. Forest plantings have further reduced the northern range, particularly in the Lake States (see "Timber vs. Wildlife," L. A. Davenport, *Jour. of Forestry,* 39, 1941: 661–666), and improved fire protection is hastening the loss of still more.

It is well that the prairie grouse are now being studied on a wider front. Their general requirements are by no means understood as yet, and no one state contains a complete cross-section of the specific problems involved. Pheasant competition, perhaps of major importance in the North Central States, is nc problem in the South; over-grazing, so important in the South and West, cuts a minor figure in the Lake States; forest plantations and brush invasion are of more critical importance in the Lake States than elsewhere.—F.N.H.

Trumpeter Swans: a Correction

In the last issue of the *Bulletin,* Trumpeter Swan population figures for the last eight years were quoted from *Wildlife News.* Those figures refer only to Trumpeter Swan populations in the United States, although the quotation did not so specify. There are thought to be about 500 more Trumpeter Swans in western Canada.—F. N. H.

National Defense and Conservation

In order to protect vital defense secrets and the whereabouts of military installations, the Army has prohibited hunting along many parts of the Pacific coast. It is possible that there will be no open season along the entire coast region.—Leonard Wing.

Albert M. Day has informed us that " . . . the Army has definitely abandoned all plans dealing with the military development at Henry's Lake and West Yellowstone. After the situation as to the possible danger to the Trumpeter Swans was fully presented to them they completely withdrew from the area and took their winter training grounds elsewhere." (Letter, Jan. 20, 1942.)—F.N.H.

Committee Notes

Arthur S. Hawkins has asked to be relieved of his duties as a member of the Conservation Committee because of pressure of his Army duties. He is attached to the Medical Corps at Sheppard Field, Texas.

A new member, John W. Handlan of the West Virginia Conservation Commission, Division of Education, has been appointed to the Committee.—F.N.H.

Wildlife Conservation Committee
Frederick N. Hamerstrom, Jr., Chairman

ORNITHOLOGICAL LITERATURE[1]

THE WHITE-CROWNED SPARROWS (ZONOTRICHIA LEUCOPHRYS) OF THE PACIFIC SEABOARD: ENVIRONMENT AND ANNUAL CYCLE. By Barbara D. Blanchard. University of California Publications in Zoölogy, 46, No. 1: 1–178, 20 plates, 30 figures. Nov. 14, 1941. $2.00.

This is a notable paper, combining in masterly style field observation and laboratory technique, life history study and histological examinations of collected specimens. It is a systematic analysis of the differences in two races of the White-crowned Sparrow which winter together in Berkeley, California, one of them remaining there to nest, the other migrating to Puget Sound in March. Five years were spent in observation at Berkeley and one nesting season, besides one winter visit, at Friday Harbor, Washington; in both localities nesting birds were color-banded.

As to morphological differences, the northern race (*Z.l.pugetensis*) is lighter in color with "lighter weight, perhaps reflecting smaller body size, but not reflected in the dimensions of the appendages" (p. 10). In comparing winter males, 43 *pugetensis* averaged 26.6 grams and 17 *Z.l.nuttalli* 29.1 grams. The pre-nuptial molt is much more extensive in *pugetensis* than in *nuttalli*, so that "first-year Puget Sound sparrows breed in fully adult plumage, whereas first-year Nuttall sparrows breed in wholly or partially immature plumage."

The nesting cycle of the Nuttall Sparrow is divided into four chief periods: the base level (fall and winter); the rising tide of territorial and sexual instincts; reproductive; subsidence (at the time of the molt). The pair stay on their territory throughout the year, tolerating strangers, but in January the male drives out others with song and pursuit. Nesting starts in March or April, the female builds and incubates, the male helps feed; young are cared for until they are 32 to 35 days old. Sometimes three broods are fledged within 6.3 months.

Reproduction is similar with the Puget Sound Sparrow, but less leisurely; young are cared for for only 25–28 days, three broods being attempted in four months.

More than half the volume is devoted to a detailed study of the gonad cycle of the two races. Although these birds are exposed throughout the winter to identical conditions of light, temperature, and other factors, the gonads of the residents reach 5 mm^3 in early January and full size (135 mm^3) in March; while those of the winter residents reach only 4–5 mm^3 (stage 4 or 5) at this date. Dr. Blanchard finds that "temperature is the most important single factor lying at the ultimate source of annual variations of the gonad cycle" (p. 74). She divides the time of increase of the gonads into three periods: I—prior to Dec. 21; II—Dec. 21 to time of attainment of stage 5 (4 to 9 weeks); III—from stage 5 to the first eggs (7 to 8 weeks). There was no correlation with temperature in Period I; high correlation in Period II, but low correlation with precipitation and sunshine; while in Period III correlation with all factors was low. She criticizes the drawing of sweeping conclusions from experiments based on subjecting captive birds to conditions of abnormal lighting. "In fact it seems to me extremely doubtful whether the abundant means which have been discovered for upsetting the physiological balance of captive birds should be accepted as possessing any bearing whatever on the factors which control the cycle under natural conditions" (p. 76).

There is a wealth of valuable material in this volume on territory, relations of mates to each other and their neighbors, flock, and behavior, as well as the physiological and histological research. It is a brilliant piece of work and deserves wide circulation and careful study.—M. M. Nice.

ATTWATER'S PRAIRIE CHICKEN, ITS LIFE HISTORY AND MANAGEMENT. By Valgene W. Lehmann. North American Fauna 57, 1941. v + 65 pp., 14 plates, 4 text figures. $0.40 (paper), of Superintendent of Documents, Washington, D.C.

Within the last 100 years, the range of the Attwater's Prairie Chicken in Texas

[1] For additional reviews see pages 16 and 24.

has been reduced more than 93 per cent, their numbers an estimated 99 per cent. The process was about as follows: "Development of the coastal territory, as farming, grazing, and the exploiting of oil, crowded prairie chickens into ever smaller areas, where they were more easily found and killed [by hunters]." (p. 44).

Lehmann has done his best work in evaluating the influences of, and devising remedies for, the environmental factors which depress Prairie Chicken populations. The straight life-history material does not quite measure up to this standard of excellence. He has described courtship and mating, nesting; growth, development, and mortality of young; brood size and disintegration; flocking and seasonal movements; and foods. Some of this—nesting and food habits—seems plainly to be based on too little data; at other points—as brooding of young, movements—one cannot be sure of the extent of the supporting data. "Annual increase" is discussed, but is not related to replacement of annual losses. More use might have been made of the literature on the other subspecies, and on closely related species.

These are minor criticisms and would not apply were this not, presumably, a completed study.

The discussion of environmental relationships is packed with sound life-history and ecological material (perhaps there is a parallel here with the best of "functional" architecture). One section is devoted to habitat requirements: "Optimum prairie chicken range apparently consists of well-drained grassland, with some weeds or shrubs, the cover varying in density from light to heavy; and with surface water available in summer; diversification within the grassland type is essential." (ii.) Another treats of limiting factors, both natural (rainfall, drought, spread of woody vegetation, predation. etc.) and artificial (agriculture, burning, over-grazing, hunting, etc.). One of the most important of the natural limiting factors is rainfall in May: while rain cannot be regulated by man, he can take account of it in setting the times and places of hunting seasons. In the main, the man-made limiting factors have done far more damage than the natural.

The final section, on management, shows what environmental manipulations are needed and in what seasons they are effective. These recommendations, wisely, are of two orders of intensity: a set of procedures for those interested in moderate improvement of the habitat, and another for those who wish to go still farther. He has made it plain that the welfare of Prairie Chickens depends on the landowner, and further believes that large Federal or State refuges are absolutely essential.

The current catch-word "too little and too late" could fairly be applied to the attempts to save the Heath Hen. Because of a host of conflicting interests, too little was ever done; when really serious work was begun, it was begun too late. It remains to be seen whether the Attwater's Prairie Chicken, sometimes called the Heath Hen of the South, will fare better. Lehmann's work is a major step in the development of methods, and a timely one.—F. N. Hamerstrom, Jr.

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PROCEEDINGS OF THE TWENTY-SEVENTH ANNUAL MEETING

BY OLIN SEWALL PETTINGILL, JR., SECRETARY

The Twenty-seventh Annual Meeting of the Wilson Ornithological Club was held November 20–23, 1941, on the campus of the University of Illinois at the invitation of the Department of Zoology, Illinois State Natural History Survey, Natural History Museum, Urbana-Champaign Bird Club, Animal Ecology Club, and the Wildlife Club. Headquarters, one session, and dining quarters were in the attractive new Illini Union Building; the remaining sessions were in Gregory Hall.

The Executive Council met on Thursday evening. Friday and Saturday were devoted to two short business sessions, three sessions of papers, one session of natural color slides and motion pictures, a symposium, a show of natural color motion pictures, two open houses, a meeting of the Membership Committee, an auction of paintings, and the Annual Dinner. On Sunday there was a field trip to the Lake Chautauqua Wildlife Refuge.

Meeting of the Executive Council

Dr. Josselyn Van Tyne was unanimously reappointed Editor of *The Wilson Bulletin*.

The Council accepted the invitation of Cornell University and the Cornell Laboratory of Ornithology to hold its 1942 Annual Meeting at Ithaca, New York. The meeting will take place on Friday and Saturday, November 27 and 28.

After some discussion as to possible meeting places in 1943, St. Louis, Missouri, was tentatively decided upon.

At the suggestion of the Treasurer, who has customarily served as Chairman of the Endowment Fund Committee, the Council authorized the organization of a new Endowment Fund Committee with a person other than the Treasurer as chairman and with committee members representing various sections of the country. It was the opinion of both the Treasurer and the Council that such a chairman would have more time in which to direct the affairs of this committee.

The Council reviewed the two amendments to the Constitution which were proposed at its meeting in 1941 (see *Wilson Bulletin*, 53: 59) and which were now on the table awaiting the action of Club members at the Saturday afternoon Business Session. It recommended the adoption of the first amendment to Article II, Section 3. This amendment reads: The dues of all associate members shall be raised from one dollar and fifty cents ($1.50) to two dollars ($2.00); the dues of all active members from two dollars and fifty cents ($2.50) to three dollars ($3.00).

Affiliations with the Inland Bird-Banding Association, the Virginia Society of Ornithology, and the Georgia Ornithological Society were approved by the Council.

In order to coordinate further the work of the various standing committees and the officers, the Council ruled that the chairmen of all standing committees shall be invited to participate in future Council meetings in an advisory capacity.

The need for revision and subsequent publication of the Constitution and By-Laws was expressed by the Secretary.

Business Sessions

President Lawrence E. Hicks called to order the first business session on Friday morning at 9:45. The minutes of the previous meeting were approved without being read since they had already been published in *The Wilson Bulletin*. The reports of the Secretary, Treasurer, Editor, and Librarian were read and approved.

The President appointed the following three temporary committees:

Resolutions: L. H. Walkinshaw, Frank Bellrose, Jr., and F. N. Hamerstrom, Jr.

Auditing: R. M. Strong and Burt L. Monroe.

Nominating: Margaret M. Nice, Harry W. Hann, and Richard L. Weaver.

A list of persons nominated to membership during the current year was placed on the table for approval by the organization.

The reports of the following committees were read and approved: Program, Endowment Fund, Membership, Wildlife Conservation, Affiliated Societies, Index, Library, and Illustrations.

The second and final business session was called to order at 2:15 Saturday afternoon by Vice-President Sutton.

Persons nominated to membership during the current year were formally elected.

The two amendments to Article II, Section 3, of the Constitution which were proposed by the Council at the Twenty-sixth Annual Meeting at Minneapolis were voted upon. The first amendment, bearing the Council's recommendation, was accepted unanimously. The second amendment was rejected.

The Resolutions Committee presented the following resolutions which were then adopted:

Whereas, the Sandhill Crane is becoming an increasingly rare breeder in the North Central States, and *Whereas,* Bernard W. Baker of Marne, Michigan, has purchased 491 acres of marsh in Calhoun County, Michigan, for the establishment of a Sandhill Crane Sanctuary, be it *Resolved,* that the Wilson Ornithological Club extend a vote of appreciation to Bernard W. Baker, one of its members, for establishing such a sanctuary.

Whereas, the White-winged Dove in the Rio Grande valley in Texas is rapidly decreasing in numbers due to the accelerated appropriation of its habitat by the clearing of lands essential to its perpetuation; and *Whereas,* the Fish and Wildlife Service and the Texas Game, Fish, and Oyster Commission have recognized the precarious situation of the bird and have conducted research for the purpose of determining measures which might be taken to preserve it, and have reached rather definite conclusions indicating that its preservation is dependent on the purchase and protection of specific nesting grounds, and on other measures; now therefore be it *Resolved,* that the Wilson Ornithological Club urge the Fish and Wildlife Service and the Texas Game, Fish, and Oyster Commission to take the necessary steps at the earliest possible time to insure the perpetuation of this species; and be it further *Resolved,* that copies of this resolution be sent to the Director of the Fish and Wildlife Service and the Texas Game, Fish, and Oyster Commission.

Resolved, that the Wilson Ornithological Club join with the National Audubon Society and other conservation organizations in advocating uniform state laws conforming to the terms of the new New York State law, carrying into effect the conditions of the Joint Declaration of Policy and Program entered into by the National Audubon Society and Feather Industries of America, Inc. Be it further *Resolved,* that the Wilson Ornithological Club join with the National Audubon Society and other conservation organizations in advocating an amendment of the Federal Tariff Act to eliminate the proviso which now permits importation of wild bird plumage for use in the manufacture of fish flies and the importation of manufactured fish flies containing wild bird plumage.

Resolved, that the Wilson Ornithological Club at its Twenty-seventh Annual Meeting on November 20-23, 1941, in Urbana-Champaign, Illinois, express its sincere thanks to its hosts who have made this meeting so pleasant and successful and to the University of Illinois, especially to the members of the Local Committee and its Chairman, S. Charles Kendeigh, to the Department of Zoology, Illinois Natural History Survey, Natural History Museum, Urbana-Champaign Bird Club, Animal Ecology Club, and the Wildlife Club.

The Nominating Committee offered the following report:

President—George Miksch Sutton, Laboratory of Ornithology, Cornell University, Ithaca, New York.

First Vice-President—S. Charles Kendeigh, University of Illinois, Champaign, Illinois.

Second Vice-President—Olin Sewall Pettingill, Jr., Carleton College, Northfield, Minnesota.

Secretary—Maurice Brooks, West Virginia University, Morgantown, West Virginia.

Treasurer—Gustav Swanson, University Farm, St. Paul, Minnesota.

Additional Members of the Executive Council—Eugene P. Odum, University of Georgia, Athens, Georgia; Burt L. Monroe, Anchorage, Kentucky; Lawrence H. Walkinshaw, Battle Creek, Michigan.

The report of the Nominating Committee was accepted by motion and the Secretary was authorized to cast one ballot for the nominees, thus electing them officers of the Wilson Ornithological Club for the ensuing year.

The session was formally adjourned at 4:00 P.M.

Papers Sessions

The opening session began on Friday morning with an address of welcome by Dr. Carl G. Hartman, Head of the Department of Zoology and Physiology, and a response by President Lawrence E. Hicks.

The remainder of the Friday morning session, the Saturday morning session, and a portion of the Saturday afternoon session were devoted to the reading of papers. There were altogether 19 papers devoted to the following ornithological studies: life history, 5; distribution, 5; historical, 3; population, 3; wildlife management, 1; bird sounds, 1; taxonomic, 1.

Below is given the program of papers, together with brief abstracts:

Opening Session, Friday Morning, November 21

1. Harry W. Hann, University of Michigan. *The Cowbird at the Nest.* Illustrated by 3¼" x 4" slides. (20 minutes.)

(Abstract omitted because this paper was published in the last December issue of *The Wilson Bulletin.*)

2. Maurice Brooks, West Virginia University. *Birds at the Extremities of Their Ranges.* (12 minutes.)

(This paper is being published in *The Wilson Bulletin.*)

3. Ferd Luthy, Duck Island Preserve, Peoria, Illinois. *"Report of the Superintendent."* (10 minutes.)

Interesting excerpts from an unsigned typewritten manuscript entitled: "Superintendent's Second Annual Report to the Duck Island Club." The report was dated January 19, 1897. The Club, established in 1886, was located five miles from Lake Chautauqua.

The above report described the marsh conditions, summarized the number of hunting days and resultant kill, mentioned the "crippling" loss and the necessity (?) for artificial feeding and a bag limit of 25 "within a few years."

4. C. W. G. Eifrig, Concordia Teachers College, River Forest, Illinois. *Illinois Ornithology at Seventy and Ninety Years Ago.* (15 minutes.)

About 1870-72 the late E. W. Nelson carried on extensive ornithological research in northeastern Illinois, mainly in the vicinity of Chicago. He published his results in *The Bulletin of the Essex Institute* in 1876. In this paper the great changes in bird life between then and now were pointed out.

5. George Miksch Sutton, Laboratory of Ornithology, Cornell University. *Is Sutton's Warbler a Valid Species?* (15 minutes.)

(This paper has now been published in the *Cardinal,* 5, No. 7, Jan., 1942: 151–154, 2 pls.)

6. Pierce Brodkorb, University of Michigan Museum of Zoology. *Life Zones versus Biotic Areas in Chiapas, Mexico.* (15 minutes.)

The avifauna of Chiapas is divisible into major altitudinal groups, each of which has two or more isolated subdivisions. The break between life zones and biotic areas occurs at different places for different species. The degree of endemism in each area is inversely correlated with increasing altitude. Time rather than physical isolation appears to be the primary factor controlling speciation in this region.

Saturday Morning

7. Dorothea W. F. Ewers, Department of Psychology, University of Chicago. *The Calls of Song Sparrows, Bobolinks, and Goldfinches Raised in Captivity.* Illustrated with disc recordings. (20 minutes.)

A comparison of the calls of the following birds: two male Song Sparrows raised by Mrs. Margaret M. Nice; two male Bobolinks raised by O. S. Pettingill, Jr.; and a male and female Goldfinch raised by William E. Schantz.

8. Katherine A. White, University of Michigan Biological Station. *Frequency of Occurrence of Summer Birds in the Immediate Vicinity of the University of Michigan Biological Station.* Illustrated by 3¼" x 4" slides. (15 minutes.)

A study of the composition of the bird population in the vicinity of the University of Michigan Biological Station during the summer of 1941 using Jean M. Linsdale's method of applying Raunkaier's Law of Frequence.

9. B. W. Cartwright, Ducks Unlimited, Winnipeg, Manitoba, Canada. *Birds Observed in the Perry River District, Queen Maud Gulf, Canadian Arctic, by Angus Gavin.* Illustrated by 2" x 2" slides. (20 minutes.)

Circumstances leading up to the discovery of the breeding grounds of Ross's Geese (announced in 1940) and the discovery of the breeding grounds of Tule Geese in 1941, with further detailed observations made in 1941 on Ross's Geese and a brief account of the bird life of the hitherto unexplored Perry River country.

10. Leonard C. Brecher, Louisville, Kentucky. *Early Ornithologists and Their Books.* Illustrated with 2" x 2" Kodachrome slides. (20 minutes.)

Since there has been no simple published account of the works of the men who have influenced North American Ornithology, this paper presented a survey of the men and their chief works in their historic sequence. For illustrative purposes three slides of an original chart were projected on the screen. This chart had been compiled to show the relationship of one man's life span to another and to give the dates of each man's publications. The "period system" advanced by Elliott Coues was extended back to Aristotle and continued to the present.

11. J. Frank Cassel, Laboratory of Ornithology, Cornell University. *An Inland Island—A Preliminary Discussion of the Ornithological Significance of the Black Hills of South Dakota and Wyoming.* Illustrated with 3¼" x 4" slides. (15 minutes.)

In southwestern South Dakota and extreme northeastern Wyoming, rising from two to three thousand feet above the surrounding plains, lies an area of approximately 50 by 100 miles known as the Black Hills. The Biological Survey's life zone map (1910) indicates this region as a spot of Canadian in the southern extremity of an arm of Transition Zone. Pitelka (1941) in his map of the major biotic communities of North America shows it as an island of coniferous forest amid a sea of extensive grassland.

In spite of the facts of this interesting isolation of the Black Hills, and of their being the home of at least one endemic species—the White-winged Junco, and

of their lying on the periphery of the range of 107 of the 189 birds listed as breeding, little concentrated ornithological work seems to have been done in the region. The purpose of this paper was twofold: first, to call the attention of bird students to a unique territory; and second, to inquire after the unpublished data of any who have worked there.

12. O. Ruth Spencer, University of Michigan Biological Station. *Studies in the Life History of the Black-billed Cuckoo.* (15 minutes.)

A discussion of the observations made at the University of Michigan Biological Station during the summers of 1939 and 1941. Information was obtained on such phases of the Cuckoo's life history as egg-laying intervals, length of incubation period, length of nestling life, feeding habits, and frequency of feeding the young.

13. Robert C. McClanahan, U. S. Fish and Wildlife Service, Washington, D.C. *Waterfowl Investigations in the Prairie Provinces of Canada, 1940–1941.* Illustrated by 3¼" x 4" slides. (15 minutes.)

Continuing investigations begun by the Fish and Wildlife Service in 1934 on the waterfowl nesting areas of Manitoba, Saskatchewan, and Alberta, the months of June, July, and August of 1940 and 1941 were spent on the prairies of southern Canada. As a result of subnormal precipitation only a relatively small number of sloughs were available as nesting sites, yet by far the most important factor limiting increase was a breeding stock insufficient to occupy the available water. In 1940 there was no indication of any serious loss of ducklings from lack of water, and in 1941 the loss was not much greater. Mortality from several other adverse factors was noted, but in neither year was this considered excessive. Whereas a slight increase of waterfowl was predicted in 1940, practically no changes in the numbers of waterfowl sent south from the prairies were predicted in 1941.

14. Verna R. Johnston, University of Illinois. *Factors Influencing the Distribution of Woodland Birds in Winter.* Illustrated by 3¼" x 4" slides.

This study of a second-growth Illinois forest covered one and one-half years. Wind and temperature had varying effects upon the distribution of the birds in winter: a strong wind caused day by day shifts in location; temperature influenced the amount of feeding and vertical distribution. Winter flocking tendencies were analyzed and the composition of an average flock determined.

15. Margaret M. Nice, Chicago, Illinois. *Song in Female Birds.* Illustrated by 3¼" x 4" slides. (15 minutes.)

Singing in birds is usually thought of as a male prerogative. In some species, however, females regularly sing, while in others they do so sporadically. A theory of the possible evolution of song in male and female birds was suggested. Song is innate in both sexes. Where song serves chiefly territorial uses and territorial defense is primarily taken over by one sex; then song is most highly developed in this sex, and may almost disappear in the other. In individual cases where territorial responsibilities are thrust upon the normally less active bird, it may respond with excellent song (e.g., Blanchard's female White-crowned Sparrows). Where song serves as a bond between the sexes, it naturally is well developed in both.

16. Richard Lee Weaver, Dartmouth College, Hanover, New Hampshire. *Notes on the Life History of the Pine Siskin.* (15 minutes.)

A summary was given of thirty days of observation on the building of the nest, laying of the eggs, incubation, and raising of the young of a pair of Pine Siskins at Hanover, New Hampshire during April and May, 1941. There were also general observations on the Siskin populations of 1941 compared with Siskin populations of other years and with those of other northern finches.

SATURDAY AFTERNOON

17. ROBERT E. HESSELSCHWERDT, Illinois State Natural History Survey. *Wildlife Restoration Experiments on Intensively Farmed Land in Champaign County, Illinois.* Illustrated by 3¼" x 4" slides. (15 minutes.)

The work described in this paper is concerned with the problem of establishing good wildlife restoration methods on the very intensively farmed land in the black soil prairie region where corn and soy beans are the most important crops.

The factors most influential in this region are: (1) soil of superior fertility linked with (2) a class of farming people superior in education, wealth, and aggressiveness.

Because of the universal use of modern farming machinery, including mechanical corn pickers, there is a large food supply in the form of waste grains for upland game and other wildlife species. This food supply is not being utilized because it is not balanced by adequate protective cover. The situation is being met by the establishment of 3½ miles of fence-row plantings on the 4-square-mile development area, utilizing shrubs and evergreens which conform with the special requirements of the region.

Fifty-six large nest boxes built at a total cost of approximately $98 and installed in trees and hedges on the study area, have produced in two years a total of 32 young Screech Owls, 19 young Sparrow Hawks, 37 young fox squirrels, 200 pounds of wild honey, and good winter shelter for many wildlife species. These boxes have also produced much information on the nesting habits and food habits of the Screech Owl.

18. FRANK BELLROSE, JR., Illinois State Natural History Survey. *Waterfowl Populations in the Illinois River Valley.* Illustrated with 3¼" x 4" slides. (15 minutes.)

Population estimates of waterfowl on representative lakes in the Illinois River valley have been made since 1938. Graphs, based on the number of birds per acre of water surface, showed the relative abundance of the more important species of waterfowl.

Various factors affect the seasonal and annual abundance of waterfowl in the Illinois Valley. Water and food supply are the two most important factors.

19. GEORGE MIKSCH SUTTON, Laboratory of Ornithology, Cornell University, and OLIN SEWALL PETTINGILL, JR., Carleton College and the University of Michigan Biological Station. *The Birds of a Bull's Horn Acacia.* (15 minutes.)

A common shrub of Mexico is the Bull's Horn Acacia which possesses large paired thorns in which live a species of red-and-black ant. On the Rancho Rinconada in southwestern Tamaulipas, headquarters of the Cornell University-Carleton College Expedition, grew one such shrub in which nested a pair of Derby Flycatchers (*Pitangus sulphuratus*) and a pair of Giraud's or Social Flycatchers (*Myiozetetes similis texensis*). In a blind set up by this shrub for observation purposes a female Hooded Oriole (*Icterus cucullatus cucullatus*) built her nest.

During a period of 25 days considerable information was obtained on the life histories of these individual birds and the ecological relationships of birds, ants, and shrub.

NATURAL COLOR SLIDES AND MOTION PICTURES SESSION
SATURDAY AFTERNOON

20. EDWARD MORRIS BRIGHAM, JR., Kingman Memorial Museum, Battle Creek, Michigan. *Some Unusual Experiences with Michigan Birds.* Kodachrome slides and 16" x 20" black and white enlargements. (20 minutes.)

A popular account of Bald Eagles nesting on the ground in jackpine country,

photographing Hudsonian Curlews and Kirtland's Warblers, a male Bob-white incubating a clutch of eggs from early July to early October, and visits to a Black-crowned Night Heron and Common Tern colony.

21. Lawrence H. Walkinshaw, Battle Creek, Michigan. *Some Sandhill Cranes in Native Habitats.* Kodachrome motion pictures. (15 minutes.)

Views of cranes and crane habitats in Michigan, the Kissimmee Prairie of Florida, Jackson County in Mississippi, Malheur National Wildlife Refuge in Oregon, Caribou County in Idaho, and Juab County in Utah.

22. Rosalie Edge, Emergency Conservation Committee and Hawk Mountain Sanctuary Association, New York City. *Hawk Mountain Comes to the W.O.C.* Kodachrome motion pictures. (Because Mrs. Edge was unable to attend the meeting, the pictures were presented by Roger Tory Peterson.)

A pictorial record of a typical October day at Hawk Mountain, Pennsylvania, showing the numbers of visitors and the numbers of hawks and eagles seen from the crest of the mountain.

A Symposium on the Distribution of Birds in Relation to Ecological Concepts

On Friday afternoon from 2:00 to 4:00 a symposium was held on the biome concept in bird distribution in contrast to the life-zone concept. The symposium was led by Dr. V. E. Shelford of the University of Illinois.

Eugene P. Odum, University of Georgia. *Relation of the Distribution of Birds to Biomes.*

John W. Aldrich, Fish and Wildlife Service, Washington, D.C. *Birds of a Deciduous Forest Aquatic Association.*

Joseph J. Hickey, New York City. *Deciduous Forest Birds.* (Paper presented by S. Charles Kendeigh.)

O. A. Stevens, North Dakota State Agricultural College. *Grassland Birds.*

Roger Tory Peterson, National Audubon Society, New York City. *Coniferous Forest Birds.*

Following the above presentations the Chairman led an interesting discussion in which ten persons participated.

A Show of Natural Color Motion Pictures

During Friday evening three members presented some of their latest motion pictures as follows:

The Bobolink and the Blue Jay. Olin Sewall Pettingill, Jr., Carleton College and University of Michigan Biological Station.

Bird Life of the Miami Valley. Karl H. Maslowski, Cincinnati, Ohio.

Wings of the West. Cleveland P. Grant, Baker-Hunt Foundation, Covington, Kentucky.

Through the courtesy of the U.S. Fish and Wildlife Service, W. F. Kubichek's film on the home life of the Western Grebe was shown at the conclusion of the show.

Open Houses

The Vivarium Building was open to visitors between 4:00 and 6:00 on Friday afternoon and guides were available from the Animal Ecology Club. Researches in progress dealing with photoperiodism, metabolism, continuous record of activity, and bird parasites were on exhibit. The Natural Resources Building was open to visitors from 6:00 to 8:00 on Friday evening. Guides from the Wildlife Club were available to show the work in progress dealing with birds, mammals, fish and wildlife management.

The Natural History Museum on the second floor of the Natural History Building was open for inspection throughout the meeting. Here were exhibits of all common Illinois birds as well as representatives of other major animal groups.

Meeting of the Membership Committee

A special meeting of the Membership Committee was called to order on Friday afternoon by its Chairman, Dr. Richard L. Weaver. Twelve members and the Secretary were present. This meeting gave excellent opportunity for the members of this important committee to pool their suggestions for increasing the effectiveness of their work. The progress of the past year was reviewed and plans for the coming year were formulated.

An Auction of George Miksch Sutton's Original Paintings

Following the sessions of Saturday afternoon, the members and visitors adjourned to the nearby Y.M.C.A. Building to participate in an auction of Sutton originals (six small-sized watercolor paintings and one pencil drawing). Mr. James Boswell Young of Louisville, Kentucky, served as auctioneer. The irresistible humor and entreaties of the auctioneer made the occasion highly enjoyable and successful. As had been previously announced, the entire sum of money obtained from this auction will be used in financing illustrations for *The Wilson Bulletin*.

The Annual Dinner

The Annual Dinner in the Illini Union Building on Saturday evening had the largest attendance in the history of the Wilson Ornithological Club—altogether 174 persons were present.

An attractive pen-and-ink sketch of a Wilson's Plover by T. M. Shortt of Toronto, Canada, decorated the menu and small, original sketches by the same fine artist enlivened the place-cards at the speakers' table.

Following the dinner Dr. Theodore H. Frison, Chief of the Illinois State Natural History Survey, spoke on the present wildlife management program of the Survey with particular reference to ornithological activities and showed a Survey film, "Nest Boxes for Wildlife Restoration, with Special Reference to the Wood Duck." Then Murl Deusing, Naturalist and Lecturer of the Milwaukee Public Museum, showed his natural color film, "Wild Wings," containing numerous episodes in the life histories of the Great Blue Heron, Blue-winged Teal, Mourning Dove, Woodcock, American Bittern, Barn Swallow, Ruby-throated Hummingbird, Rose-breasted Grosbeak, and Herrings Gulls.

Field Trip

On Sunday about seventy members and visitors went on a field trip to the Lake Chautauqua Wildlife Refuge on the Illinois River near Havana. The trip was sponsored by the Illinois State Natural History Survey. A journey around the Refuge was made in the Survey's boat. Approximately 150,000 ducks, mostly Mallards, were seen.

Attendance

According to the registration books 241 persons attended the meeting, but this figure does not include the large number of visitors attending the show of motion pictures on Friday evening.

One hundred and thirty-four of the persons in attendance were members, the largest number ever to attend a meeting of the Wilson Ornithological Club. Of these members, two were Founders, 12 were Councillors, 5 were Past Presidents. Several members traveled great distances to attend. Among them were: B. W. Cartwright of Winnipeg, Manitoba; Wendell P. Smith of Wells River, Vermont; Richard L. Weaver and Mrs. L. A. Forsyth of Hanover, New Hampshire; George L. Wallace of Lenox and Miss Ruth D. Turner of Melrose, Massachusetts; E. T. Nelson of New Brunswick, New Jersey; Miss Theodora Nelson of New York City; D. R. Hostetter of Harrisonburg and Mrs. G. T. Wiltshire of Lynchburg, Virginia; Eugene P. Odum of Athens, Georgia.

Twenty-two states and the District of Columbia were represented. Next to Illinois the state with largest attendance was Michigan with fifteen members and seven visitors present.

The list of members in attendance follows:

From **Georgia**: 1—E. P. Odum, Athens. *Visitor,* 1.

From **Illinois**: 39—A. I. Means, Atwood; A. L. Eustice, Barrington; K. E. Bartel, Blue Island; Miss V. R. Johnston, Cerro Gordo; H. G. Anderson, S. C. Kendeigh, C. O. Mohr, H. C. Seibert, R. E. Yeatter, Champaign; Wendell Dahlberg, C. O. Decker, Mrs. Dorothea Ewers, Alfred Lewy, L. B. Nice, Mrs. M. M. Nice, Mrs. W. D. Richardson, W. C. Stanett, R. M. Strong, Chicago; Miss K. A. White, Collinsville; G. B. Happ, Elsah; Harold Ault, Fiatt; H. M. Holland, Galesburg; Rev. G. M. Link, Grafton; W. H. Elder, Havana; C. F. McGraw, Milan; Miss O. R. Spencer, Moline; Ferd Luthy, Peoria; T. E. Musselman, Quincy; C. W. G. Eifrig, River Forest; Frank Bellrose, Jr., V. E. Shelford, Mrs. E. L. Snapp, Mrs. V. Vaniman, H. R. Wanless, and L. E. Yeager, Urbana. *Visitors,* 80.

From **Indiana**: 8—Miss Margaret Umbach, Fort Wayne; Miss M. F. Campbell, Miss M. R. Knox, Miss Dorothy Hobson, Miss C. A. Moore, Indianapolis; Miss Elizabeth Mullin, Muncie; C. G. Fredine, C. M. Kirkpatrick, Lafayette. *Visitor,* 1.

From **Iowa**: 1—Jean Laffoon, Sioux City.

From **Kansas**: 1—Miss Lena Feighner, Kansas City. *Visitor,* 1.

From **Kentucky**: 13—B. L. Monroe, Anchorage; C. P. Grant, Covington; Clayton Gorden, H. C. Rogers, Glasgow; C. C. Counce, Hopkinsville; L. C. Brecher, Miss Amy Deane, Miss R. J. Green, Miss Helen Peil, Miss E. J. Schneider, Miss Mabel Slack, Miss A. A. Wright, J. B. Young, Louisville. *Visitors,* 2.

From **Manitoba**: 1—B. W. Cartwright, Winnipeg.

From **Maryland**: 1—W. J. Howard, Chevy Chase.

From **Massachusetts**: 2—G. J. Wallace, Lenox; Miss R. D. Turner, Melrose.

From **Michigan**: 15—Pierce Brodkorb, J. L. George, H. W. Hann, J. Van Tyne, H. H. Wilcox, Jr., Ann Arbor; E. M. Brigham, Jr., L. H. Walkinshaw, Battle Creek; Mrs. G. A. Kelly, Miss G. V. Sharritt, Miss E. W. Townsend, Detroit; S. M. Pell, Huron Mountain; C. H. Cook, Lakeside; B. W. Baker, Marne; F. N. Hamerstrom, Jr., Pinckney; Mrs. E. D. Keifer, Port Huron. *Visitors,* 7.

From **Minnesota**: 4—W. J. Breckenridge, Gustav Swanson, Minneapolis; O. S. Pettingill, Jr., Miss Peggy Muirhead, Northfield. *Visitor,* 1.

From **Missouri**: 5—G. H. Klinkerfuss, Mrs. G. H. Klinkerfuss, Normandy; Miss N. L. Binnington, Richard Grossenheider, Wayne Short, St. Louis. *Visitors,* 6.

From **New Hampshire**: 2—Miss L. A. Forsyth, Richard Weaver, Hanover.

From **New Jersey**: 1—E. T. Nelson, New Brunswick.

From **New York**: 3—G. M. Sutton, Ithaca, Miss Theodora Nelson, R. T. Peterson, New York City. *Visitor,* 1.

From **North Dakota**: 1—O. A. Stevens, Fargo.

From **Ohio:** 12—K. H. Maslowski, Cincinnati; Miss M. E. Morse, Cleveland; Miss Vera Carrothers, East Cleveland; H. L. Barry, L. E. Hicks, D. L. Leedy, R. H. Mills, Columbus; J. H. Jenkins, Mt. Vernon; T. W. Porter, Oak Harbor; Lynds Jones, Oberlin; Harold Mayfield, Toledo. *Visitors,* 5.

From **Pennsylvania:** 5—M. G. Netting, G. B. Thorp, W. E. C. Todd, A. C. Twomey, Pittsburgh; J. F. Cassel, Reading.

From **Tennessee:** 1—A. F. Ganier, Nashville.

From **Vermont:** 1—W. P. Smith, Wells River.

From **Virginia:** 2—D. R. Hostetter, Harrisonburg; Mrs. G. T. Wiltshire, Lynchburg. *Visitor,* 1.

From **West Virginia:** 3—I. B. Boggs, Maurice Brooks, Morgantown; Mrs. Elizabeth Etz, Wheeling.

From **Washington, D.C.:** 3—Frank C. Craighead, R. C. McClanahan, J. W. Aldrich.

From **Wisconsin:** 9—Mrs. H. L. Playman, Mrs. W. E. Rogers, Appleton; W. E. Scott, Madison; Murl Deusing, Carl Kinzel, W. J. Mueller, Peter Steib, Milwaukee; R. H. Gensch, Rhinelander; Miss E. M. Heinke, Stoughton. *Visitor,* 1.

Summary of Attendance: Total registration, 241 (members, 134, visitors, 107); Total from Urbana-Champaign, 38 (members, 11, visitors, 27); Total from Illinois, 119 (members, 39, visitors, 80). Total outside of Illinois, 122 (members, 95, visitors, 27). Maximum number at each session: Friday morning, 160; Saturday morning, 175; Saturday afternoon, 200; Symposium, 150. Approximate number at motion picture show Friday evening, 460. Number at Annual Dinner, 174. Number of persons in group photograph, 154.

REPORT OF THE MEMBERSHIP COMMITTEE

The present Chairman assumed office in January 1941. The committee has been enlarged since then to seventy members so as to have active representatives in most of the states and in the larger metropolitan areas or centers of ornithological activity.

The committeemen have been exceptionally active and have recommended a great many ornithologists and naturalists for membership.

Some members who had been delinquent in dues for two years were induced to rejoin the Club.

The descriptive folder for the Club and the *Wilson Bulletin* have been of great value in interesting people in the organization and in obtaining new members.

As the result of the cooperative efforts of the whole committee 284 new members have been added to the Club during 1941. They are divided as follows: one Sustaining, 35 Active, and 248 Associate Members.

November 22, 1941.

Respectfully submitted,
RICHARD L. WEAVER, *Chairman.*

The Chairman of the Membership Committee announces the following additions to the Committee:

Illinois	Mrs. Virginia Eifert	Ohio	Karl Maslowski
Indiana	C. Gordon Fredine	Oklahoma	Leonard Uttal
Massachusetts	Miss Ruth D. Turner	Washington, D.C.	John Aldrich
Missouri	Wayne Short		James O. Stevenson
New York	Roger Tory Peterson	West Virginia	I. B. Boggs
North Dakota	Stanley Saugstad	Canada	B. W. Cartwright

ADDITIONAL NEW MEMBERS

The following applications for membership in the Wilson Ornithological Club were received between November 15 and December 31, 1941. They could not be included in the annual membership roll published in *The Wilson Bulletin* for December, 1941, and are therefore included in this issue. All will, of course, be included in the next complete membership roll published.

Sustaining

Alfred Leroy Eustice, Bright Land Farm, Barrington, Ill.

Active

James Henry Bruns, 724 Whitney Bldg, New Orleans, La.
Lieut.-Col. Robert Patrick Carroll, Honeysuckle Hill, Lexington, Va.
Russell Benjamin Harris, 2100 Madison Ave., Apt. 2, Toledo, Ohio.
Harold Holmes Harrison, The Valley Daily News, Tarentum, Pa.
Alexander Henderson, 89 Woodland Road, Chestnut Hill, Mass.
Francis Lee Jackson, 541 Hammond St., Chestnut Hill, Mass.
Dr. G. H. Klinkerfuss, 340 Bermuda Ave., Normandy, Mo.
Mrs. G. H. Klinkerfuss, 340 Bermuda Ave., Normandy, Mo.
Dr. Earl Newlon McCue, P. O. Box 104, Morgantown, W. Va.
Walter Rosene, Jr., 1210 Jupiter, Gadsden, Ala.
Miss Maxine Thacker, Branchland, W. Va.
Mrs. Joseph E. Vollmar, 6138 Simpson Ave., St. Louis, Mo.
Henry Taylor Wiggin, 131 Tappan St., Brookline, Mass.

Associates

William Bryan Barnes, Room 10, State House Annex, Indianapolis, Ind.
Ernest Nutter Beatty, Jr., 2206 Auburn Ave., Cincinnati, Ohio
George Charles Becker, Port Edwards, Wis.
Miss Elizabeth Margaret Boyd, Mount Holyoke College, South Hadley, Mass.
Miss Arminta Alice Brandenburg, State Hospital, Toledo, Ohio.
Joseph Brauner, 151 Savoy St., Bridgeport, Conn.
Miss Katherine Marie Brindley, 1920 Mt. Vernon Ave., Toledo, Ohio
Eugene Spencer Castle, 80 S. State St., Elgin, Ill.
Roland C. Clement, 804 Walnut St., Fall River, Mass.
John A. Collins, Jr., 20 Quincy St., Lawrence, Mass.
James Earl Comfort, 551 W. Kirkham Ave., Webster Groves, Mo.
James F. Comfort, 27 N. Iola Dr., Webster Groves, Mo.
Frank C. Craighead, 5301 41st St., N.W., Washington, D. C.
Edmund Rust Cross, 1751 University Ave., San Diego, Calif.
Miss Amy Deane, 2313 Hale, Louisville, Ky.
George Andrew Dorsey, Vinings, Ga.
Harry E. Duer, 1651 E. 93rd St., Cleveland, Ohio.
Mrs. Elaine Edmonds, Keene Valley, N. Y.
Mrs. H. D. Eifert, Illinois State Museum, Springfield, Ill.
Donald S. Farner, Biology Building, Madison, Wis.
James Bush Fleugel, 1104 American National Bank Bldg., Kalamazoo, Mich.
Harold Nelson Gibbs, A-71 Sowams Rd., Barrington, R. I.
Herchel T. Gier, Ohio University, Athens, Ohio.
Clayton Goodwin, Glasgow, Ky.
Miss Cora Janet Hackett, 3934 Avery Ave., Detroit, Mich.
L. George Hoth, 4 Cross Place, Glen Ridge, N. J.
John D. Jameson, Sugar Hill, N. H.
Charles M. Kirkpatrick, Dept. of Forestry, Purdue University, Lafayette, Ind.
Frank J. Kozacka, 81 Cedar St., Amesbury, Mass.

Duncan McArthur Marshall, 12801 Gratiot Ave., Detroit, Mich.
Miss Esther Mason, Montgomery Ave., Louisville, Ky.
Robert H. Mitchell, 19 S. Liberty St., New Concord, Ohio.
Miss Laura Brooks Moore, French Creek, W. Va.
Mrs. Louise Davol Nortin, 360 Prospect St., Fall River, Mass.
Miss Helen Peil, 2064 Sherwood Ave., Louisville, Ky.
Robert Allan Pierce, Nashua, Iowa.
Mrs. H. L. Playman, 217 N. Union St., Appleton, Wis.
Miss Marian Frances Pough, 4 Lenox Place, St. Louis, Mo.
Samuel Dowse Robbins, Jr., 422 N. Murray St., Madison, Wis.
H. C. Rogers, Glasgow, Ky.
Mrs. Otto Ruccker, Seapowet Farm, Tiverton, R. I.
J. Max Shepherst, 504 River Rd., Maumee, Ohio.
Albert E. Shirling, 3849 E. 62, Kansas City, Mo.
Luther Ely Smith, 1554 Telephone Bldg., 1010 Pine St., St. Louis, Mo.
Harry Herbert Stone, Jr., P. O. Box 101, Sturbridge, Mass.
S. Warren Sturgis, 66 Marlboro St., Boston Mass.
Ralph W. Velich, Nebraska State Museum, University of Nebraska, Lincoln, Nebr.
Alfred Wallner, 111 Roby Rd., Madison, Wis.
Louis M. Weber, 2713 Dadier St., St. Louis, Mo.
Miss Audrey Wright, 1312 Hepburn, Louisville, Ky.
Arnold Zempel, 7823 Stanford Ave., University City, Mo.

REPORT OF THE WILDLIFE CONSERVATION COMMITTEE

The membership of this committee has been changed somewhat, to give a better geographic spread. The present members are:

Rudolf Bennitt
C. A. Dambach
Paul L. Errington
Wallace Grange
Ludlow Griscom
F. N. Hamerstrom, Jr.
Arthur S. Hawkins
William J. Howard
Harrison F. Lewis
Seth H. Low
Margaret M. Nice
Miles D. Pirnie
Richard H. Pough
Herbert L. Stoddard
Gustav Swanson
Milton B. Trautman
Leonard W. Wing

The work of the Committee has appeared currently in the *Bulletin* and needs no review here.

I should like to emphasize one point. The Conservation Committee can do a better job if every member of the Club will take part. From time to time, the Committee will call on individuals for information on specific problems; however, I urge every member of the Club to send me suggestions without waiting to be asked. If you have an article for the Conservation Section of the *Bulletin,* or if you have a lead that the Committee should follow up, send it in; if you have criticisms of the work of the Committee, let me know. The Committee will appreciate your help in keeping posted.

November 18, 1941.

F. N. Hamerstrom, Jr., *Chairman.*

REPORT OF THE COMMITTEE ON AFFILIATED SOCIETIES

With profound regret, your Committee on Affiliated Organizations has to record the death of one of its members, Dr. Myron H. Swenk, of the University of Nebraska, within the past year.

During the year since the Minneapolis meeting the movement toward affiliation of ornithological societies in the United States and Canada has gained momentum.

The Wilson Club itself, and the Cooper Ornithological Club have consummated affiliation with the American Ornithologists' Union. At the Denver meeting of the A.O.U. this past September our club was officially represented on the Council by Dr. George M. Sutton.

Shortly after last year's meeting Mr. Ganier prepared a letter dealing with affiliation matters and it was sent to the officers of a number of state ornithological societies.

We are happy to report that during the year three strong and active organizations, the Inland Bird Banding Association, the Virginia Ornithological Society, and the Georgia Ornithological Society, have, by practically unanimous vote, signified their intention and desire to affiliate with the Wilson Club. Formal consummation of this affiliation will be effected during the present meeting.

Dr. Kendeigh has drawn up the articles of affiliation which will be used.

The Executive Committee of the Wisconsin Society of Ornithology has expressed interest in possible affiliation, and has decided to present the matter for a vote to the entire society at a meeting next April. Other state organizations have shown an interest in affiliation, and it is hoped that our association may grow in numbers and mutual usefulness.

Respectfully submitted,
MAURICE BROOKS, *Chairman*

November 20, 1941.

REPORT OF THE LIBRARIAN FOR THE YEAR ENDING NOVEMBER, 1941

I have the honor to present herewith the eleventh annual report of the Librarian of the Wilson Ornithological Club.

Many valuable gifts have been presented to the library this past year. There were 247 unbound periodicals and reprints received from thirty members of the Club. In addition there were 23 bound volumes from five members. A detailed list of these gifts will be found in the four numbers of the *Wilson Bulletin* for 1941.

We are receiving 59 journals, some in exchange for the *Wilson Bulletin* and others by gift. Because of the unsettled condition of the world we have not received some numbers but enough keep slipping through to encourage us in the belief that we will eventually have a complete file of all the journals.

All 1941 *Bulletins* printed to date have been received and housed in a suitable place. There has been a brisk sale of the *Bulletins* this past year which may make it necessary to provide more space for the office supply that is used for current distribution.

May the Librarian call attention to a new edition of the Union List of Serials in Libraries of the United States and Canada, edited by Winifred Gregory, which will be available early in 1942. Members can check this list to find what we have of any one title. If you find you have duplicates of anything we lack, the Librarian will be glad to receive them. The Union List will be found in most libraries over the United States and Canada.

Respectfully submitted,
F. RIDLEY HARRELL, *Librarian.*

November 19, 1941.

REPORT OF THE SECRETARY FOR 1941 [1]

Membership in the Wilson Ornithological Club now totals 1,181 and is classified as follows: Honorary, 4; Life, 10; Sustaining, 38; Active, 374; Associate, 755.

Altogether 178 members were lost during the year: 173 were delinquent in dues or resigned; 5 were taken by death. The total number of new members obtained this year will be announced by the Chairman of the Membership Committee,

[1] Revised through December 31, 1941.

Dr. Richard L. Weaver. For his tireless efforts in securing this remarkably high figure, he alone deserves this privilege. The Secretary will only say that we now show a net gain of 141 members over the total for 1940 *and a net gain of 137 over the all-time-high of 1939!* After several years of trial and error, it appears that this organization has finally hit upon a surefire method of membership solicitation.

Ohio continues its lead of the past several years with 118 members. Michigan, New York, Illinois, Minnesota, and Pennsylvania follow with 98, 83, 80, 74, and 61, respectively. The state showing the greatest rise in members is Wisconsin—its membership is nearly double that of last year.

The total distribution of members by states, provinces, and foreign countries is given below. The figures in parentheses indicate the number of members new to the organization in 1941.

UNITED STATES		
Alabama	5	(2)
Arizona	13	(7)
Arkansas	5	(1)
California	50	(4)
North Carolina	7	
South Carolina	5	
Colorado	12	(2)
Connecticut	8	(1)
North Dakota	10	(1)
South Dakota	4	(1)
Delaware	1	
Florida	14	(2)
Georgia	18	(7)
Idaho	3	(1)
Illinois	80	(13)
Indiana	29	(9)
Iowa	27	(4)
Kansas	5	
Kentucky	25	(8)
Louisiana	10	(4)
Maine	6	
Maryland	14	(1)
Massachusetts	48	(21)
Michigan	98	(24)
Minnesota	74	(9)
Mississippi	6	(1)
Missouri	35	(15)
Montana	6	(1)
Nebraska	11	(3)
New Hampshire	11	(6)
New Jersey	18	(7)
New Mexico	6	(1)
New York	83	(17)
Ohio	118	(36)
Oklahoma	11	
Oregon	6	
Pennsylvania	61	(12)
Rhode Island	5	(3)
Tennessee	19	(1)
Texas	22	(1)
Utah	13	(8)
Vermont	5	(3)
Virginia	16	(5)
West Virginia	18	(8)
Washington	7	(2)
Washington, D. C.	26	(2)
Wisconsin	56	(25)
Wyoming	9	(1)
Alaska	2	
Virgin Islands	1	
CANADA		
Alberta	1	
British Columbia	2	
Manitoba	3	
Ontario	22	(4)
Quebec	2	
Saskatchewan	2	
FOREIGN COUNTRIES		
Cuba	1	
Great Britain	2	
Northern Rhodesia	1	
Switzerland	1	
Venezuela	2	

From February through June the Secretary was away on an expedition to Mexico. A large part of his duties were assumed by the Treasurer. The remainder were undertaken by the Editor and the Chairman of the Membership Committee. To these gentlemen he is deeply indebted.

At the conclusion of this meeting the Secretary will have completed his fifth and last year of office. He will leave the office grateful that he received the very finest cooperation from members the country over and with the everlasting feeling that he has enjoyed and will continue to enjoy the many acquaintances which the office has brought him. May his successor be as fortunate!

Respectfully submitted,

November 21, 1941. OLIN SEWALL PETTINGILL, JR., *Secretary*

REPORT OF THE TREASURER FOR 1940

Balance as shown by last report, Nov. 20, 1940	$ 114.57	
Total receipts from dues, subscriptions, and contributions Nov. 20, 1940, to Nov. 17, 1941	2,450.22	
TOTAL RECEIPTS		$2,564.79
Disbursements:		
Subscription refunds	$ 9.36	
Secretary's expense	148.96	
Annual meeting expense	160.29	
Editor's expense: postage, mailing *Bulletin*	60.67	
Membership committee expense: postage, printing	180.59	
Treasurer's expense: postage, printing, clerical aid	110.68	
Bank charges: exchange charges, returned checks	42.35	
Bulletin expense: printing, engraving	1,809.86	
TOTAL DISBURSEMENTS		$2,522.75
Balance on hand in St. Anthony Park State Bank, St. Paul, Minn., on November 17, 1941		$ 42.04

Respectfully submitted,
GUSTAV SWANSON, *Treasurer*

November 22, 1941.

Approved by Auditing Committee
R. M. Strong
Burt L. Monroe

WILSON ORNITHOLOGICAL CLUB LIBRARY

The following gifts have been received recently:

William H. Behle—4 reprints
Maurice Brooks—1 reprint
Adrian C. Fox—1 reprint
F. N. Hamerstrom, Jr.—44 pamphlets and reprints
Mrs. Earle Jackson—1 bulletin
E. A. McIlhenny—2 reprints
Margaret M. Nice—1 reprint
William H. Phelps—1 pamphlet
Edward C. Raney—2 reprints
A. W. Schorger—70 pamphlets
A. M. Woodbury—3 reprints
C. Brooke Worth—14 reprints

There is a demand for information on current wildlife research in the United States. The U. S. Fish and Wildlife Service will therefore endeavor to assemble and release this information annually in condensed form. They suggest that you send to them in Washington before June 1 the titles of your research problems together with the year of probable completion and your name and address.

THE WILSON BULLETIN PUBLICATION DATES

The actual dates of publication of the four numbers in 1941 were: March 28, June 12, September 24, December 20.

THE WILSON BULLETIN

A QUARTERLY MAGAZINE OF ORNITHOLOGY

Published by the Wilson Ornithological Club

Vol. 54 JUNE, 1942 No. 2

DEVELOPMENT OF YOUNG GOSHAWKS

BY RICHARD M. BOND

THE nesting habits and development of the young of the Goshawk (*Accipiter atricapillus*) are apparently less well known than is the case with either of the other two North American accipitrines. The following account is based largely on a single bird, but it has been carefully checked by Dr. R. M. Stabler, who has also raised a female goshawk from the nest, and has observed the development of another owned by a friend. The developmental stages of the three followed the same sequence and lasted the same lengths of time within a few days at most. My experiences in raising 33 nestling hawks of other species, and in following the development of siblings of the captives in the wild in nine nests, indicate that the physical and psychological schedule followed by normal and well-fed young hawks of the same species and sex is subject to very slight variation, whether the birds are captive or wild. The only sexual difference consists in a slightly slower development of the females, which may spend a day or two longer in the nest and, in the case of the Duck Hawk, may become independent of their parents as much as a week later than their brothers. Even Bent's (1937: 125–142) generally excellent account contains several questionable statements. These may be taken up in order:

"The young apparently remain in the nest about four weeks . . ." The Dixons' (1938) interesting study shows that the young remain in the nest about 42 days, or 6 weeks.

"The young . . . are fed at very infrequent intervals." The Dixons too believed that the young were fed little and seldom towards the end of their period in the nest (though they observed them to be heavily fed when younger). This idea is not borne out by examination of specimens. Young hawks deprived of food for unusual periods during the growth of rectrices and remiges show very distinct marks of weakness across the feathers, which falconers call "hunger streaks" or "hunger traces."

A young female Goshawk that I took from a nest in Nevada on July 2, 1939 (Bond, 1940) was obtained in the morning before the parents fed her, and I was unable to give her a meal until about 1:00

P.M. A marked hunger streak developed from this delay in feeding. The streak was wider and stronger than any of those on the skins in the Museum of Vertebrate Zoology. Of course, the time of the last meal of the previous day is not known, so the actual time without food is uncertain also. Later, when the bird was well feathered and able to fly (though the flight and tail feathers were still growing) slight hunger streaks developed on days when she was fed only morning and evening, with a maximum waking period without food of only about 9 hours. Since only about 10 per cent of the immature Goshawks in the Museum of Vertebrate Zoology, Berkeley, California, show minor hunger streaks, it would appear that in the wild some 90 per cent of the young are fed at least three times a day, and practically all young at least twice a day, *every day,* not only in the nest but for an appreciable period after they are able to fly.

Bent says of the Goshawk, "When between three and four weeks old, it is fully fledged, except that the last of the down persists on the belly and neck. It leaves the nest at about this stage." If by "fully fledged" is meant that all of the feathers are grown in all the way, the statement is obviously erroneous. The young birds cannot fly till they are about six weeks old, but it is long after this that the feather growth is completed. My young bird could with great effort make a level flight of perhaps 15 feet on July 14, at which time comparison with Dixon's photographs would indicate that she was about 40 days of age, but feather growth was not complete until about August 10, when she was between 65 and 70 days old. Even if (as is possibly the case) she developed a little more slowly than a wild bird would have, she can hardly have been delayed over a week, so that it appears that young female Goshawks are not fully fledged until they are about 9 weeks of age, at least.

Throughout Bent's book, and indeed in most life history accounts of hawks, there are statements about many of the species, that at a given stage or age the young "leave the nest," and the reader gains the impression from these statements that the young leave the nest once and for all at this time, though Bent says of the Northern Red-shouldered Hawk, "They begin by climbing out on the branches and, perhaps, returning to the nest at night," and quotes Bendire on the Mexican Goshawk: "The young . . . were out of the nest the following day but returned to it at night." I believe this is a very common practice among tree-nesting hawks. Herrick (1924 and elsewhere) observed that young Bald Eagles return to the nest, and I have found young of Bald Eagles, Golden Eagles, Cooper Hawks, and Western Red-tails back in the nest a day or more after they have "left" it. Hawbecker (1940) found the same true of White-tailed Kites. Young European accipitrines (*Accipiter gentilis* and *A. nisus*) were known to the falconers as "branchers" when they left the nest by day and hopped and

climbed about the trees while still incapable of extended flight (Bert, 1891).

My young Goshawk gave evidence that returning to the nest was normal behavior. She was provided with a high-sided cardboard box of about the diameter of the nest, in which excelsior and twigs were placed. She soon learned to climb out of the box, though with some difficulty, and spent much of the day wandering around the large room in which she was kept. At first she clambered back into the box every evening and went to sleep there. In scrambling into or out of the box, she did not use her beak, parrot fashion, as I have sometimes seen young Cooper Hawks do. The night of July 13 (39 days old) she slept on a coil of rope beside the box, which was much more like a natural nest than the box and its contents, and continued to use it till the night of July 21 (47 days old), after which she always slept on a perch. This is hardly a proof, but it is certainly an indication that the young may return to the nest at night for at least a week after first flying from it.

Until August 7, when she was about 64 days old, the bird spent considerable, though diminishing, periods during the day resting in a prone position. After that date this behavior was not noted. Whether wild young rest in this position on the ground, in the nest, or on large limbs of trees I do not know, but I see no reason to suppose that this habit in my bird was exceptional (though it may have been protracted) and it may indicate occasional use of the nest by wild young during the day for some time. In the prone sleeping position, the young Goshawk rested on its tarsi, which were splayed out at an angle of some 15 degrees, and on the sternum. The feet were loosely closed, and the wings drooped, so that the outer joint rested on the ground. The head was turned back on either side and partly concealed under the wing on that side. The daytime prone resting position was the same, except that the head was held up.

During the first few nights that my bird slept on a perch she rested on both feet, but later she slept standing on only one foot with the other drawn up under the feathers. The head was turned back and partly concealed under the scapulars. She slept on either foot, but more often the left than the right, and turned her head back on either side. She also held her food with the left foot more often than with the right, and thus appeared to be somewhat "left-handed."

The developmental behavior of young Raptores is exceedingly interesting (see especially Sumner, 1934, and the papers in his bibliography), and many of their activities and reactions change almost from day to day. I have not had the opportunity of observing the first month of development of Goshawks, but young of the related Cooper Hawk begin by being mildly interested in an intruder and may show a desire to be fed if their crops are not full, and sometimes even when they are.

They show little or no evidence of fear until about the time they are able to stand easily (about 15 days in the Cooper Hawk). At this stage a definite fear reaction appears, and for two or three days young birds which I observed have crowded to the far side of the nest from an intruder and cowered there. In a few minutes the reaction "runs down" and the young settle back into the nest. Within a day or two of the fear reaction, and perhaps sometimes concomitant with it (Sumner, 1929), there develops what I have come to call the "stabbing reaction" that causes the young birds to strike or "stab" at an intruding object with the foot. The object is subjected to a momentary hard grasp and the foot is withdrawn. A crouched position, very similar to that of the fear reaction, is often assumed when the "stabbing reaction" is manifested, but whereas in the former case, the bird gives somewhat the effect of shrinking from an expected blow, in the latter one may be reminded of a tom cat getting ready for battle.

The nest from which I took my young bird contained, in addition to the female, a male that was apparently three or four days older than his sister; an addled egg found in the nest probably was laid between the two that hatched, unless Goshawks lay at greater intervals than other hawks of like size. The younger female exhibited the "stabbing reaction," but this, when it failed to discourage me, was quickly succeeded by the simple fear reaction, and she backed to the extreme edge of the nest and very nearly fell out. The older male, although he assumed the "cowering" position and maintained it as long as my companion and I were in sight, showed no fear, and, far from retreating, was most aggressive, "stabbing" at anything that came within reach. The female on the other hand, after a little gentle handling, lost both reactions, unless she was threatened by a sudden motion, whereupon the fear reaction returned. The term "reaction," as here used, refers to what are doubtless chains of several reflexes, some of which may be conditioned. When either of the young birds was seized by the leg or feet, it first attempted to struggle free, and tried to bite only after an appreciable interval.

Defense reactions of young and adult hawks of all species with which I am familiar usually subside quickly if they have no apparent success. If the hand is seized or bitten and (as a natural result) quickly withdrawn, the bird will clutch or bite all the harder and try to do it again. If instead, by wearing a glove or by fortitude, the hand is kept quiet and not even tensed, the hawk usually lets go within a few seconds. In other words, the reaction seems to require more or less continuous stimulus.

Feeding

Immediately after removal from the nest the young bird took food readily from the hand. If given a larger piece of food than usual, she

would attempt to swallow it, but if it would not go all the way down, she would open her beak and shake her head until it dislodged. Occasionally she picked it up and tried it again, but usually she turned her attention to me and waited for another piece. Even if the piece was small enough to be swallowed, but was dropped for some other reason, she usually did not pick it up. It was not until July 10, when she was about 36 days old, that she first put her foot on a piece of meat and tore off mouthfuls with her beak after the normal fashion of an adult, and it took about a week more for her to become adept at it. The common falconine trick of picking up a small object in one foot to lift it to the mouth for swallowing or further tearing (Bond, 1936: 73–74) has never been observed in my Goshawk, nor in the various Cooper and Sharp-skinned Hawks that I have had. Feather development was appreciably more advanced in this Goshawk when she learned to feed by herself than is usually the case with young Cooper Hawks taken from the nest and raised the same way.

Killing Reaction

Accipitrine hawks kill their prey with a clutch of great power that drives the talons deep into the flesh of the prey. The clutch may be maintained for several minutes after the prey ceases to struggle, but if the first clutch is ineffective it may be relaxed, the foot moved slightly and the clutch repeated. Though the initial clutch is usually made with both feet, the feet subsequently are moved alternately, or at least one at a time, so that the prey is never released. After some of the skin or plumage has been removed from the prey with the beak, the killing clutch is relaxed and ordinary feeding begins. My Goshawk first showed the killing reaction in response to moving food on July 27 (about 53 days old). This reaction seldom was evoked by pieces of beef unless they were thrown on the ground or pulled about on a string. It was produced fairly often, however, by dead sparrows or mice even when they were fed on the glove in the usual way. If the bird had been fed on beef for several days and then killed a rabbit, even though she was very hungry she would cuff the rabbit about and "kill" it repeatedly, sometimes for 15 minutes or more before starting to eat (see below under "Play"). Dr. R. M. Stabler (MS) writes that his adult female Goshawk, when merely standing on his fist will exert instantaneous, terrific pressure when he makes a squeak like a dying mouse. My own bird had no such reaction to sounds. The killing reaction seems quite possibly a development of the "stabbing reaction."

Bathing

On July 23, I tethered the Goshawk (about 49 days old) by a small, quiet stream for the first time. She jumped off her perch, and, apparently by chance though perhaps purposely, landed in about three inches

of water where she stood quietly for perhaps 30 seconds. She then let her belly feathers droop loosely into the water, put her head down and tasted it a few times, and then proceeded to bathe substantially like any passerine or other bird. She has spent as much as 20 minutes standing in the water and going through the bathing motions five to eight times in that period. Stabler (MS) says that his Goshawk "has stood in her bath upwards of an hour—even in February. The Peregrines leave it immediately when actual bathing is over—they never 'soak.'" This was near Philadelphia. When the water was deep enough, my bird waded in till the water came about half way up her breast. She frequently ducked her head entirely under the water. The stimulus to bathe is at least partly tactile, since she would go through part of the motions when made to stand in a few inches of water with her hood on (thus being entirely blindfolded), but the completely dis-

Figure 1. Immature female Goshawk in typical pose of playful curiosity. (Photograph by R. M. Stabler, of his bird.)

played bathing reaction seems to be largely a response to visual stimulation, as Sumner (1934) found with the Golden Eagle. Stabler (MS) states that he has "had young Accipiters go through the ducking and body-stooping movements when showered with a watering-pot; or even do it on a bare floor at the mere sight of a sister sloshing about in a bathing pan." The stimulus that causes a hawk to cease bathing, leave the water, and begin to dry and preen herself may be body chill, but this is only a guess.

Play

Some of my Goshawk's activities may be described as play, though the term might not stand analysis in all cases. In addition to cuffing a dead bird or mammal about as described above, she always launched an attack upon her perch each time she was put on it for the day. She would leap into the air a foot or two and seize the perch in her feet, only to leap again, often coming down facing the other way. This seems quite distinct from the wing exercises of young raptores in the nest; it was the attack on the perch with the feet that was important. She also frequently gave the cackle of the adult. This sort of play usually kept up for 10 or 15 minutes. Stabler (MS) reports an extensive repertory of play activities by his Goshawk. She often launches a violent attack on a leaf, stick, or pebble. Both birds seize small objects in their beaks and toss them back over their heads.

When my hawk had been fed and was standing on my glove she frequently fluffed her feathers out a little and let her eyelids droop slightly and would then begin to bite gently at the edge of my coat, the buttons, button holes, a pencil in my breast pocket, my handkerchief or my hair. When she got a good grip on something with her beak, she would often bite quite hard and pull toward her. When she did this, she almost invariably pulled the nictitating membranes at least part way across her eyes. This action of the nictitating membrane is the same as that observed when she wiped her beak after a meal. She frequently succeeded in removing my handkerchief from my pocket, whereupon she might either drop it, or step on it and begin to tear it with her beak. When she was in the mood, a strange object, or even my fingers, at about the level of her feet or over her head would often cause her to turn her head nearly upside down as if to see it the better.

These generalized play activities I have not observed in wild hawks more than a few weeks old, that is, after they have scattered and are on their own. This may be because of difficulties in observation, or it may be exaggerated and prolonged in a bird with its "feeling pent up" by captivity. Stabler (MS) reports no diminution of play by his bird, now nearly five years old.

Dr. Stabler's criticisms and comments on this paper are thankfully acknowledged, as are those of E. L. Sumner, Jr., and Dr. A. H. Miller.

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THE BIRDS OF A BULL'S HORN ACACIA [1]

BY OLIN SEWALL PETTINGILL, JR.

THE bull's horn acacia is a common shrub of the low country of southwestern Tamaulipas, Mexico. In general appearance it is much like other shrubs of the *'huisache'* brushland, but close scrutiny reveals the fact that its thorns are large, paired, and hollow; and that at the tips of the leaflets there are tiny, yellowish, pear-shaped "Beltian bodies" (see Schimper, 1903: 141). These bodies are rich in albumen and, together with a sugary fluid produced by the shrub's petiolar glands, form the food supply of certain red-and-black ants (probably *Pseudomyrma* sp.) which spend their entire lives on the shrub, rearing their young in the hollow thorns. The ants and the shrub live in perfect symbiosis, the former benefiting by the thorns and the food, the latter being defended by the ants. Touch a branch of the acacia and see what happens! Out pours a formidable army, each ant ready to bite and sting in defense of self and home.

Not far from the headquarters house of the 1941 Cornell University-Carleton College Expedition [2] grew one of these dense, broad-topped acacias. It was about twelve feet high. In April it was covered with fresh foliage and golden yellow flowers. Its huge, straw-colored thorns were generously tenanted with *Pseudomyrma*. In the warm sunlight the ants coursed busily over the entire plant—the main trunk, the branches, the leaves, and the flowers. Breaking the paired thorns apart at the point of union revealed the presence of eggs, larvae and excited, bellicose adults.

This particular acacia might never have been noticed had not a pair of Derby Flycatchers (*Pitangus sulphuratus texanus*) chosen to nest in its top. Here, early on the morning of April 1, both birds were discovered carrying big mouthfuls of grass and weed-stalks. The nest had obviously just been started. The birds stopped building shortly after they were discovered and departed without a syllable of protest.

During the following three days the flycatchers were seen several times within a short distance of the acacia, but no building was observed and the nest's foundation remained crude and scanty. On April 5 building was resumed for two hours, both male and female participating energetically. Together the pair flew in from a distance, alighting on a tall tree near the acacia. After some minutes of hesitation at this lookout post, one bird swooped gracefully down to the acacia and set to work. Somewhat clumsily the mouthful of grass was added, pressed down with feet and belly, and molded to the contours of the body. The bird turned

[1] I appreciate the careful criticism of this paper by George Miksch Sutton and Margaret M. Nice.

[2] On the Rancho Rinconada, near Gomez Farias, Tamaulipas.

almost incessantly, now and then lifting the edges of the foundation with its bill, thus beginning the walls. Cries continued to come from both birds; low, conversational syllables from the builder; loud, piercing notes of *geep, geep career!* from the mate on lookout. When one bird was through at the nest, the other descended with its mouthful. Sometimes their mouthfuls were so bulky that they flew awkwardly. Occasionally only one bird brought nest material; again, both brought material, one depositing it while the other waited its turn, with mouth full, only a few inches away. They were never out of sight of each other while building; nor were they silent for more than a few seconds at a time.

Figure 1. Derby Flycatcher carrying nesting material. The bird is sitting on a branch of the bull's horn acacia.

During this two-hour period of activity motion pictures were obtained without the aid of a blind at a distance of *fifteen feet.* Little did I realize that this one spurt of nest building was the most intensive I would witness.

The flycatchers visited their nest infrequently during the next two days, their coming invariably being announced by loud cries. Even by April 7 the nest had changed but little. From April 8 to 14 the birds

came to the acacia now and then, but they showed little interest in it. A few loud calls, prolonged vigil at the lookout tree, swoops to the nest with wisps of material, long absences: these were the usual thing. The nest gradually increased in size, of course. The walls rose. A thin dome with ample entrance at one side became vaguely visible. By April 14 the nest was large and conspicuous, almost as visible as the acacia itself!

On the morning of April 14 we erected a tower blind about fifty feet from the acacia. The blind itself was eight feet from the ground and was covered with firm, light weight, green tent-cloth. On each of its four sides a spindle-shaped aperture was cut.

On April 16, I was surprised to discover long strands of palmetto fiber *within this blind.* Some were dangling slack, half pulled through the apertures; others were scattered on the floor; still others, in an upper corner and oddly entangled, were suspended from two fibers looped through the fabric as if by an upholsterer with sickle needle! My astonishment was by no means lessened when, fifteen minutes later, a female Hooded Oriole (*Icterus cucullatus cucullatus*) suddenly appeared at an opening, perceived the photographer, and hastily departed, dropping the fiber in her retreat. From a tree close by she scolded harshly. Soon her mate appeared and both birds scolded. The cloth roof of the blind, it appeared, had been chosen in preference to that time-honored nesting site—the under side of a palmetto leaf. Never had a higher compliment been paid to a blind-maker! But, although delighted with this wholly unexpected turn of events, I was obliged to face the fact that this sanctum was no longer a hide. What the blind might do to conceal me, the orioles now would promptly undo!

For seven days the flycatchers continued with their dilatory building, but the oriole went on diligently selecting her fibers with care and carrying all material by herself. Her mate sang persistently and often escorted her to and fro but did not once enter nor alight on the blind.

The oriole nest was attached to the cloth in four places where from six to eight fibers were looped through holes punched by the bird's bill. The loose ends of these fibers were drawn together and interwoven, thus forming a strong hammock in which the cup was placed. In reaching the cup the bird was obliged to squeeze through the narrow space between the nest's rim and the roof of the blind.

On April 23 the flycatchers' nest appeared to be finished. The roof was now thick and compact, the opening distinct, the interior dark. But what was in it? No one cared to climb the ant-guarded acacia. The blind would have to be moved, that was obvious. Oriole or no oriole, close-up photographs of the flycatchers would have to be taken, and a platform was needed for determining the contents of the nest. The blind was moved at noon. Both Hooded Orioles were away. The flycatcher's nest was empty. As the blind was set in its new position close against the acacia the big, vociferous Derbies were nowhere to be seen.

When, in mid-afternoon, I approached the blind (now about fifty feet from its original position) the female oriole flew out with her usual flurry and protested vigorously. Within half an hour the Derbies returned to their lookout. One promptly flew down to the nest with some grasses in its beak, entered, deliberately added these bits to the lining, and remained. The other departed. After a stay of perhaps a quarter of an hour the bird at the nest slipped away quietly.

While the Derbies were off a pair of Social Flycatchers (*Myiozetetes similis texensis*), which for several days had been noted about the

Figure 2. Social Flycatcher on the bull's horn acacia.

Rancho, suddenly alighted on the acacia. In their beaks were tufts of soft, yellowish, plant down which they hurriedly stuck into a thorny crotch about five feet from the Derby Flycatcher nest. Apparently this was not their first visit, for foundation material of a similar sort was already in place. The Derbies did not return. The Social Flycatchers went on with their work. The Hooded Orioles flitted about, scolding harshly, but at this the Social Flycatchers showed neither offense nor alarm. That evening the blind was moved to the other side of the tree whence the newcomers could be watched to better advantage. In the big Derby nest there was now one egg. It had been laid since mid-afternoon.

The next morning, April 24, the Hooded Oriole was in the blind (now in its *third* position). The Social Flycatchers were extremely active. They chattered constantly, were erratic in manner, as usual, fluttering their wings as if nervous or frightened, in all ways furnishing a marked contrast to the stolid Derbies. Their fidgetiness—their almost comical refusal to keep still—called to mind some form of *hyperthyroidism!*

Four times during the three hours of observation that morning the Derby Flycatchers returned to their nest, one bird bearing each time a few wisps of grass and remaining in the nest from fifteen to twenty minutes, the other staying at the lookout. Only once did they display resentment toward the *Myiozetetes*. The bird on the lookout suddenly swooped, chased one of the smaller flycatchers with loudly snapping mandibles, and disappeared. The *Myiozetetes* resumed work as soon as the Derby was out of sight.

The Social Flycatchers' nest-building habits were much like those of the Derbies. The male and female invariably went about together, each one carrying material and placing it in the nest. The nest was much like the Derbies' too, with the entrance at the side. It was considerably smaller, however, and the materials used were noticeably softer.

On the morning of April 28 both the Derby and the Social Flycatchers were at the acacia, but all four birds were comparatively inactive. That afternoon neither species of flycatcher was in evidence, but the oriole was hard at work, her nest now almost finished. During one quarter-hour period she was seen to enter the blind with fibers several times.

Wishing to photograph the oriole as she entered the blind, I set my camera up twenty feet away and carefully pinned shut all the openings save that facing me. Soon the oriole appeared, flew to the top of the blind, uttered a few alarm notes, and disappeared on the other side. A few moments passed and all at once out flew the oriole through the unpinned opening at the front! Determined creature that she was, she had forced her way through one of the *pinned* openings. The openings were now pinned shut anew, with their edges overlapped. Photographic success came at last when the oriole, failing to force an entrance elsewhere, finally gathered courage and entered at the desired place. This time the movie camera was exposing film!

On April 29, the last date on which observations at the acacia were made, the Derby Flycatcher nest held five eggs and the Social Flycatcher nest appeared to be about half finished.

Discussion

1. At no time during the observations were ants seen to annoy any bird that perched on the acacia, or to enter either flycatcher nest. Carriker (1910: 715) reports finding a *Myiozetetes texensis columbianus* nest in a "Cornusuela" tree—presumably an acacia—that must

have been, like the acacia at the Rancho, a myrmecophytic species, for it was tenanted by a "medium-sized black ant." The flycatcher nest held two slightly incubated eggs, so ants and birds must have lived without troubling one another. The slightest disturbance to any part of the tree, however, caused the ants to pour out ready for warfare!

In Salvador, Van Rossem (1914: 11–12) found Derby Flycatchers choosing for some of their nesting sites small mesquite-like trees with "greatly enlarged and swollen thorns" which almost without exception harbored ants. The ants "seemed to cause the birds no inconvenience."

In British Guiana, Cleare (1923: 182) reported Derby Flycatchers building their "nests close to large nests of wasps." Presumably the wasps caused the flycatchers no annoyance.

At the Rancho Rinconada the ants were ready to move onto any human being that disturbed *living parts* of the acacia. Whether they would have attacked when dead twigs of the acacia were touched is questionable. Perhaps the deadness of the flycatchers' nest-material furnished the nests with some protection.

2. I was much impressed with the fact that the Derby Flycatchers took *24 days* to finish their nest. Reviewing my notes covering this period (April 1 to 24) I was convinced that the most intense activity was shown on the fifth day. As for the *Myiozetetes,* they were very active during what was thought to be the first two days of nest-building, but it will be remembered that when the pair were first observed at the acacia the nest was already started. The Hooded Oriole showed more or less intense activity throughout the observed nest-building period of 11 days.

A pair of Derby Flycatchers watched by Van Rossem (1914: 11) in Salvador required "nearly a month" for completing their nest.

Observations as to the time taken by the Derbies in completing their nests tend to substantiate the generalization that tropical birds, particularly passerine birds, are much more deliberate in their nidification than allied forms of more northerly latitudes. Sutton (1928: 151) has reported on the nest of a Kingbird (*Tyrannus tyrannus*) built in Pennsylvania in thirteen days. Gillespie (1927: 53) has presented four Pennsylvania nesting records of the Crested Flycatcher (*Myiarchus crinitus*) which show that the period between the beginning of nest building and the laying of the eggs varies from seven to nine days. DeGroot (1934: 9) has observed that a Western Wood Pewee (*Myiochanes richardsoni*) in California completed a second nest of the year in three days. Information on the second nesting of an Alder Flycatcher (*Empidonax trailli trailli*) in Quebec has been obtained by Mousley (1931: 551), "the time occupied in building a new nest and laying a second set of eggs being ten days approximately." Chapman (1928: 165) found that Wagler's Oropendolas (*Zarhynchus wagleri*) of Barro Colorado Island, in the Canal Zone, required "about one

month" to complete the nest, while Herrick (1911: 364) determined that the main period of construction in the case of a Baltimore Oriole (*Icterus galbula*) observed in Ohio necessitated "about 4½ days." Perhaps the most convincing proof that nidification requires less time in northern than in southern latitudes has recently been presented by Blanchard (1941). After studying the annual cycle of two races of White-crowned Sparrow—*Zonotrichia leucophrys pugetensis*, at Friday Harbor, Washington, and *Z. l. nuttalli* at Berkeley, California—she concluded (p. 49) that birds nesting in the "short-seasoned latitudes of the Canadian border compress the active part of their reproductive cycle into less than two-thirds the time consumed by the populations of central California. In 1936 the birds at Friday Harbor segregated into pairs, established territories, and fledged three broods in less than four months. In the four years from 1935 to 1938 inclusive, the Berkeley birds consumed from 6 to 6½ months (an average of 6.3 months) to achieve the same fraction of the cycle."

3. Both sexes of the Derby and Social Flycatchers participated in nidification. So far as I know, females of Tyrannidae breeding in temperate North America build their nests unaided by the males.

4. The Social Flycatchers apparently selected the acacia because the Derby Flycatchers were nesting there. As Sutton and I have indicated elsewhere (1942: 22), each of twelve *Myiozetetes* nests (including the one now being discussed) under observation during our 1941 expedition was built near the nest of some other bird, either a Derby Flycatcher, Rose-throated Cotinga (*Platypsaris aglaiae*), Alta Mira Oriole (*Icterus gularis*), or Boat-billed Flycatcher (*Megarynchus pitangua*). In each case observed, the *Myiozetetes* nest was started after the nest of the companion species was wholly or partly finished.

Summary

The myrmecophytic bull's horn acacia, offering as an inducement its big thorns, sweetish fluid, and food bodies, attracted an ant population that in turn defended the shrub. This symbiosis between plant and insect did not prevent certain birds from nesting in the shrub. In the case discussed, two flycatcher species nested simultaneously in a twelve-foot acacia. These flycatchers were not observed to eat ants and the ants did not molest the birds nor their nests.

The smaller flycatcher (*Myiozetetes similis*) apparently chose to nest in the same shrub with the larger (*Pitangus sulphuratus*) because of the latter's ability to drive off larger enemies.

The interesting association of plant, ants, and birds attracted a wild-life photographer who, in order to secure good pictures, was obliged to erect a blind close by. The blind was chosen by a Hooded Oriole as the site of her nest.

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BREEDING BEHAVIOR OF BELL'S VIREO IN ILLINOIS

BY F. A. PITELKA AND E. J. KOESTNER

DURING the late spring and summer of 1939 we made observations on the nesting of Bell's Vireo (*Vireo belli*) at Urbana, Champaign County, Illinois. This study, while extending from May 24 to July 29, was based on necessarily brief, but regular, observations totalling approximately 35 hours. Five nests belonging to two pairs were located on the south campus of the University of Illinois. Most of the observations were made on four nests of one pair which confined its activities to a grassy area of approximately three acres containing scattered patches of shrubby fruit trees and several masses of shrubs (*Rosa* and *Ribes*). This location is referred to as area "A" (Figures 1 and 2). Supplementary observations were made on the nest of a second pair whose home area ("B") was separated from area A by a distance of

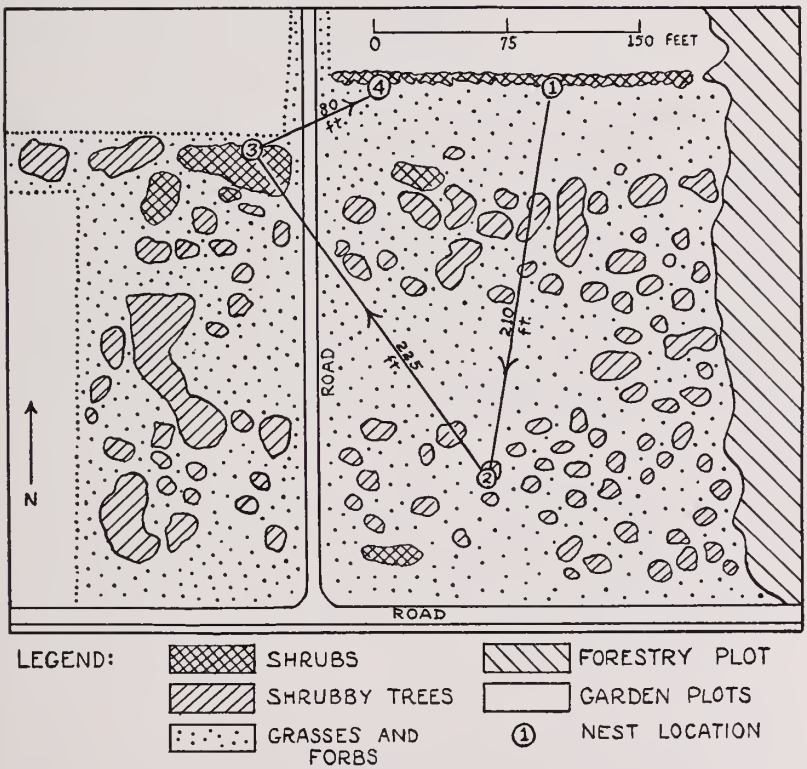


Figure 1. Map of area A, showing vegetational characters of the habitat and location of the four nests. Distances between successive nests are indicated.

Figure 2. Scene in area A, facing northeast. The apple tree at left center contained nest 2. The higher trees of the forestry plot are seen in the background.

approximately 500 feet over open, tilled garden plots to the north of area A. The edge of a dense forestry plot connected the two areas (Figure 1), but no Bell's Vireos were noted along here during the period of breeding activities.

Summary of Nesting Events

The day-to-day developments in the nesting efforts of pair A are summarized below. Apparently the same two birds of area A remained there throughout the breeding period. Members of a pair were distinguished only by a certain behavior traits (song of male, scolding and wariness of female, etc.; see Nice, 1929).

NEST 1

May 26—11 A.M. Nest contained one egg. Female on nest.
7 P.M. Female on nest.
27—Eggs 1 and 2, plus a Cowbird (*Molothrus ater*) egg. Male noted incubating.
28—Nest contained only a Cowbird egg. Nest deserted.
29—No further developments.
30—Nest and egg collected.

NEST 2

June 2—Nest contained one egg.
3—Eggs 1 and 2, plus a Cowbird egg.
4—Egg 2 gone; egg 1 and 3, plus *two* Cowbird eggs. Nest deserted.
5—No further developments; nest with two vireo eggs and two Cowbird eggs collected (Figures 2 and 3).

NEST 3

June 7—Nest incomplete; interior included some large leaves and lacked a smooth lining.
8—Nest lined with grasses.
9—No activity about nest.
10—Egg 1, plus a Cowbird egg. Female on nest.
11—Eggs 1 and 2, plus a Cowbird egg.
12—Eggs 1, 2, and 3, plus a Cowbird egg.
13—9 A.M. Eggs 1, 2, 3, and 4, plus a Cowbird egg.
6 P.M. Only eggs 1, 3, and 4, plus a Cowbird egg; nest deserted.
14—8:55 A.M. Egg 3 missing.
15—6 P.M. Egg 4 missing (no earlier visits).
16—No further developments; nest with one vireo egg and one Cowbird egg collected.

NEST 4

June 14—Adult carrying nesting material at new location.
15—Male singing vigorously at new location.
16—Nest incomplete.
17—Nest contains one Cowbird egg; lining appears thin and incomplete.
18—One vireo's egg; Cowbird egg slightly imbedded in lining indicating addition of material subsequent to its appearance.
19—Eggs 1 and 2, plus a Cowbird egg.
20—Eggs 1, 2, and 3, plus a Cowbird egg.
July 3—Eggs 1 and 2 hatched.
14—Two young leave nest; nest and remaining eggs collected (Figure 4).

Lengths of Phases of the Nesting Cycle

The nest-building period was determined to be four days in the case of the fourth nest. On the basis of intervening periods between nests No's 1 and 2 and later No's 2 and 3, the building periods for nests No's 2 and 3 were four and five days, respectively. Nice (1929: 16) reports a period of six days.

Our observations show that incubation began on the day that the first egg was laid (Lewis, 1921: 32; Simmons, 1925: 250). The female was noted at that time on nests No's 1, 3, and 4. In fact, the premature appearance of a Cowbird's egg in nest No. 4 apparently stimulated the female to incubate before the nest was completely lined and one day before her first egg appeared. Lining material was added to that nest so that the Cowbird's egg was partially buried; but on the other hand, its presence apparently hindered the female from adding as complete a lining as she had in earlier nests. The male was noted incubating at nest No. 1 after the appearance of the second egg.

In nest No. 4, eggs 1 and 2 hatched 14 days after laying of the second egg. A similar incubation period was recorded by Nice (1929: 13). The intervals between the laying of the last egg of one nest and the first egg of the next nest (area A) are extracted from the above summary as six, six, and five days, respectively. Between May 26 and June 20 (26 days), the female of pair A laid a total of twelve eggs. (All observa-

tional evidence suggests that the same birds remained on area A throughout the breeding period, but this was not proven conclusively. No additional vireos were seen there at any time).

In nest No. 4, nestling life lasted eleven days.

Cowbird Parasitism

Bell's Vireo is commonly parasitized by the Cowbird (Friedmann, 1929: 237). Three of our five nests were deserted probably because of Cowbird activities; from the other two, young were fledged. Nice (1929)

Figure 3. Nest No. 2 with two Vireo eggs and two Cowbird eggs. Inside diameter of nest, 4.5 cm.; outside diameter, 7 cm. The nest was two feet above the ground in an apple tree.

records nine nests of Bell's Vireo all of which were known to be unsuccessful, seven due to Cowbird parasitism. Bennett (1917) records twelve nests, three of which were unparasitized and successful; seven of the remaining nine nests were parasitized. Thus, out of a total of

26 nests mentioned here, only five were successful; of the 21 unsuccessful nests, 17 were failures apparently because of Cowbirds.

In our observations five Cowbird eggs were laid in the four nests of pair A. None of these hatched. The nest of pair B, observed with three young on July 11, apparently was not parasitized.

Bell's Vireo may desert when the Cowbird adds its eggs to the nest (Lantz, 1883). Other individuals of this species, as in our observations,

Figure 4. Adult Bell's Vireo at nest No. 4. The nest was 30 inches above the ground.

may tolerate the added eggs and may accept them even if they appear before the host's first egg, as in nest No. 4, but desert when an egg is removed. Still others may continue to attend a nest containing only

eggs of the Cowbird (Bennett, 1917: 286, 292). This type of variation has been noted within other species, also (Friedmann, 1929: 193; Pitelka, 1940: 6).

While we did not succeed in observing a Cowbird at or about any of the nests, the general circumstances of egg removal lead us to suggest that at least at nests No's 1 and 2, one female was responsible. At nest No. 1, both eggs of the host were taken; at nest No. 2, one egg was taken. Removal of eggs commenced after the appearance of the first and (in nest No. 1) only Cowbird egg, and probably occurred during the day that the Cowbird added its egg. In any case no eggs were removed before or at the time of laying.

At nest No. 3, three eggs were removed on successive days. Removal commenced three days after the appearance of the Cowbird egg. The first egg was taken between 9 A.M. and 6 P.M.; the second egg was taken on the following day before 8:55 A.M. In his study of molothrine parasitism of the Ovenbird (*Seiurus aurocapillus*), Hann (1941: 220) found removal to occur usually in the forenoon of the day of laying or on the preceding day. He regards a one-day lapse between appearance of the Cowbird egg and removal of a host's egg as rare. A three-day lapse occurred in removal of eggs from nest No. 3. It is still possible, but unlikely, that a Cowbird was responsible.

At nest No. 4, a Cowbird egg was added one day ahead of the first vireo egg. If the female Cowbird appeared to remove a host's egg following the laying (before 9 A.M.) of its own, the effect of the absence of any vireo eggs may have been such that the Cowbird did not reappear, and the fourth nesting was then completed successfully.

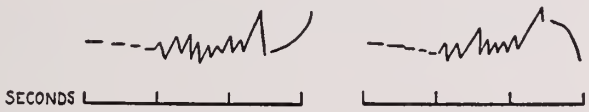
Parental Behavior

The period of nest building was marked by increased attention of the male towards the female. The male followed the female about almost continually, singing more frequently and with greater vigor than at other times of the breeding cycle. The female apparently built the nests unaided. Nice (1929: 16) states that the male may or may not assist in nest building. Both sexes incubated and both fed and brooded young. Nice (1929) and DuBois (1940) report similar observations. The sexes of other species of Vireonidae show similar relations in care of nest and young. The variation noted in the behavior of the male Bell's Vireo (Nice, 1929) is illustrated also in the Black-capped Vireo (*Vireo atricapillus*), the males of which may or may not participate in incubation (Lloyd, 1887: 295; Bunker, 1910: 72).

Song

The song as heard in central Illinois was almost identical with that recorded during earlier observations in southern Texas (Pitelka, 1938).

It is an iregular series of harsh and sharp, but slurred notes preceded by a few distinct notes of the same quality and ended with a decidedly ascending or descending note of similar harshness. Each song usually last three seconds. Two characteristic performances may be patterned as follows:



The notes are loud, emphatic, and unmusical. The last part of the song is loudest. Notes of the Rough-winged Swallow (*Stelgidopteryx ruficollis*), though less loud, are similar in quality.

As in other Vireonidae, a subdued version of the song may be given, and the male may sing intermittently during attentive periods on the eggs. Spaulding (1937: 22) states, however, that the male of Latimer's Vireo (*V. latimeri*) in Puerto Rico does not sing on the nest.

On July 2 (last day of incubation), the male sang 98 times during an early morning period of 1½ hours (6:22-7:50 A.M.). This averages approximately a song per minute, but as many as four or five songs were given per minute during brief periods of more frequent singing. Earlier in the breeding cycle, singing occurs more frequently (Nice, 1929: 13, 17). The male was noted to respond to the female with song during or following her scolding notes; this occurred when he was away from the nest as well as on the nest.

On July 2, Koestner recorded an exchange of place on the nest when, as the male left, the female approached and sang twice. The occurrence of female song in this species was not ascertained further (although suggestive evidence had been recorded on June 22 and 26). Song in female vireos has been reported in three other species: *V. atricapillus* (Lloyd, 1887: 295), *V. philadelphicus* (Lewis, 1921: 33), and *V. latimeri* (Spaulding, 1937: 18). In our observations and those of Lewis (1921: 33, 37), circumstances accompanying the singing by the female suggest that the song may function as a signal prior to exchange at the nest (Pitelka, 1940: 15). Spaulding, however, did not record female song beyond the courtship and nest building periods.

Nest Parasites

Both incubating adults and young apparently suffer infestation by the northern fowl mite, *Liponipsus sylviarum* (Can. & Franz.). On July 2, the adult bird on nest No. 4 pecked and scratched its breast while on the nest. The mites were numerous on the following day when

the young hatched. A heavier infestation was recorded at the nest of pair B, containing three young on July 11; on July 14, two young left the nest and a third was found dead in the nest. On July 15, the rim of this nest and adjoining twigs were covered with "thousands" of mites which dropped to the ground in a continual little shower.

Occurrence and Breeding Season in Illinois

In 1939, Bell's Vireo was first recorded on area A on May 17 (J. Murray Speirs). The male on area B was first noted on May 28 (Pitelka). The extreme dates of occurrence of this species in Champaign County are May 1 (Smith, 1930: 116) and September 5 (our records). (The male of pair A was last recorded singing on the home area on July 29; a male, probably that of pair B, remained singing on area B through September 5).

Previous nesting records for the state include those of Cory (1909) and Hess (1910). Eggs have been recorded from May 26 (our records) to July 4 (Hess, 1910: 29).

In east-central and northern Illinois, Bell's Vireo is apparently uncommon and local in distribution, but it is more numerous in the western and southern parts of the state. As a regular resident, the species ranges farthest east in the region of the prairie peninsula of central and northern Illinois.

Habitat Relations

The habitat occupied by the Bell's Vireos under our observation (Figures 1 and 2) was similar to sites described by other observers in Illinois (e.g., Hess, 1910: 29). The other resident species within area A were: Mourning Dove (*Zenaidura macroura*), Alder Flycatcher (*Empidonax trailli*), Catbird (*Dumetella carolinensis*), Brown Thrasher (*Toxostoma rufum*), Yellowthroat (*Geothlypis trichas*), Goldfinch (*Spinus tristis*), and Field Sparrow (*Spizella pusilla*). All of these are more or less characteristic of forest edge and growths of shrubs in this region.

In more arid portions of its range, such as western Nebraska and California, Bell's Vireo is confined largely to canyon-bottom and riparian shrub growths (Cary, 1901: 46; Grinnell and Storer, 1924: 515). Yet during field studies about Laredo, Texas (Pitelka, 1938), the species was noted in patches of mesquite (*Prosopis*) scattered over dry, open uplands.

Niche limitations confine Bell's Vireo to a low stratum of vegetation for nesting sites and food (Grinnell and Storer, 1924: 515). Individuals are seldom seen above six or seven feet in shrubby vegetation and their flights are usually made low over openings between thicket patches. As Grinnell and Storer have pointed out, other Vireonidae occurring in the same region as *V. belli* forage considerably above the six-foot level. But it is instructive to note a similarity of habitat of this and

other shrub-inhabiting vireos in areas where their ranges overlap. In southern Illinois, Ridgway (1873: 119) found Bell's Vireo within the same thickets as the White-eyed Vireo (*Vireo griseus*). In central Oklahoma, Bunker (1910: 72) found Black-capped Vireos nesting in the same thickets as Bell's Vireo. The study of interspecific relations among closely related forms occupying similar habitats has hitherto been neglected. Each of the two examples just mentioned provides an excellent opportunity to observers who are located favorably for such a study.

Summary

During the summer of 1939, five nests of Bell's Vireo were studied in central Illinois. These consisted of three attempts at nesting and a fourth successful nesting of one pair together with one successful nesting of a second pair. Nest building lasted 4 to 5 days. Incubation began after laying of the first egg and lasted 14 days. Nestling life lasted 11 days. Cowbird interference was probably the cause of desertion of the first two, and possibly three, nests of one pair. At each of these nests, desertion occurred after removal of one host egg. Nest building was done by the female. Both sexes participated in incubation and care of young. The female may sing. In Illinois, Bell's Vireo occurs in orchard thickets and groves of shrubby deciduous trees. It is known to occur in similar or the same habitats as two other shrub-inhabiting species of *Vireo* in regions where their breeding ranges overlap.

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THE SHARP-TAILED SPARROWS OF THE ATLANTIC COAST

BY WILLIAM MONTAGNA

DURING the month of June, 1939, while collecting birds in the vicinity of Popham Beach, Maine, I became especially interested in the Sharp-tailed Sparrow, *Ammospiza caudacuta*. A series of specimens indicated that this area was one of intergradation between the Acadian Sharp-tail, *A. c. subvirgata*, and the nominate race. In June, 1940, I collected Sharp-tails in New Jersey, and these birds, which should have been typical *A. c. caudacuta*, appeared to be dark-backed enough for *A. c. diversa*. Resolved to ascertain just where this last-named, southernmost race actually bred, I made trips to Delaware, Maryland, Virginia and North Carolina, in June and July, 1941. Accompanying me were Jim Fife (who also had been with me in New Jersey, in 1940) and H. Godwin Stevenson, Jr., who served as botanist. I want to express my appreciation to these men for helping me.

In the preparation of this paper I have received guidance from my friend George M. Sutton. The Museum of Comparative Zoology at Harvard University, Field Museum of Natural History, the U. S. National Museum, the Carnegie Museum, and the Museum of Natural History at the University of Minnesota have lent specimens for comparison. Louis B. Bishop, Ludlow Griscom, J. J. Murray, Arthur A. Norton, James L. Peters, Roger T. Peterson, Percy Taverner, Alexander Wetmore, and others have given me valuable information. To all the above-named men and institutions, I tender my thanks.

This paper deals primarily with the breeding distribution of these birds. I have divided the article into five sections on: breeding range, behavior of breeding birds, habitat, winter range, and relationship between Sharp-tailed Sparrows and Seaside Sparrows.

Breeding Range

Ammospiza caudacuta subvirgata.—This is the northernmost race of Sharp-tails which breeds on the Atlantic Coast. Dwight (1896) referring to this bird says that it is "peculiar to the fresh and salt water marshes of the Maritime Provinces of Canada, especially those bordering on the Bay of Fundy and the Gulf of St. Lawrence." Taverner (1927) records a specimen of this race taken at Kamouraska, which is situated on the south shore of the St. Lawrence River, eighty miles below Quebec city. Young (1931) found some Sharp-tails nesting on Grindstone Island (Magdalen Islands); unfortunately, however, no specimens were taken and I am allowing for the possibility of an error until more definite proof is given. Mr. J. L. Peters tells me that there are two sets of eggs in the Museum of Comparative Zoology taken at Goss Island,

Magdalen Islands, by E. Arnold in 1922. Arnold took no birds, only eggs and nests. It is difficult to accept such records since the eggs of Sharp-tails are much like those of Savannah Sparrows. Mr. Peters is inclined to believe that the two nests collected by Arnold look more like those of the latter bird. Brewster (1876) reported five specimens taken at Tignish, Prince Edward Island. Dwight (1887) declared these specimens and other Prince Edward birds *subvirgata*. Dwight did not report them from Nova Scotia, although Lewis (1920) found them there ". . . common in suitable localities." In our Cornell University collection we have a splendid series of adults and nestlings collected in Nova Scotia by Victor Gould at Grand Pré, Wolfville and Malassam, in King's County, and Chebaque Point, Yarmouth County. All of the birds were taken in July, 1927. In New Brunswick they are locally common, especially along the banks of the rivers which empty into the Bay of Fundy. Dwight (1887) designated Hillsborough, New Brunswick as the type locality for *subvirgata*.

Ludlow Griscom, in a recent letter to me commenting on the nesting of this bird in Maine, says that the salt marshes in that state are ". . . very small in area and are restricted to small patches at the mouths of the larger rivers and estuaries. Experience has proved that careful search shows that some Sharp-tails can be found in every one of these situations." Just in such situations as these Norton (1897 and 1927) and I (Montagna, 1940) found them in well populated colonies.

Norton (1897) suggests that north of Scarborough, Maine, it was unlikely that one would find typical *caudacuta*, because the ". . . physical features of the coast are such as to suggest the improbability of the normal range extending beyond this town." This is correct, and the fact that I took a typical *caudacuta* as well as *subvirgata* at Popham Beach substantiates the belief that this is the area of intergradation.

Norton (1897) describing the thoroughly different nature of the habitat of *subvirgata* as contrasted with that of *caudacuta* in Maine, says: "North of Scarboro, beginning with Cape Elizabeth, its eastern boundary, the coast presents an uneven or hilly face of rocks indented with coves and bays, studded with dry ledgey islands. Between the hills are innumerable arms of the sea often extending as 'tide rivers' or fjords several miles inland, bordered by narrow swales rather than broad expanses of marsh." The marshes of Popham Beach are of that description. They are surrounded by jagged, spruce-clad hills so close to the marsh that as I stood in the middle of it I could hear Hermit Thrushes (*Hylocichla guttata*) and Olive-sided Flycatchers (*Nuttallornis borealis*) singing.

It is interesting to note in *subvirgata* a tendency to frequent brackish or even fresh-water marshes. In Maine, there is a gradual transition from the broad, strictly salt-water marshes in the western portion of the state to brackish ones as one progresses eastward. This is natural be-

cause to the east, the only marshes to be found are at the mouths of rivers. Farther north, in New Brunswick and Quebec these birds become even more fresh-water-loving and Dwight (1887) calls attention to this fact in his description of *subvirgata*. He says: "One accustomed to the salt marshes where *caudacuta* makes its home would never dream of finding its northern relative inhabiting fields where grass is knee deep, and where the Bobolink and Savannah Sparrow find it dry enough to make their nests. And yet, this is the character of the marshes along the Petitcodiac River," New Brunswick, "where I have found the birds in considerable numbers." The habitat that Dwight described is possibly not altogether typical, but certainly one does not find the other coastal races of this species in such places. Thus we see a gradual transition from birds inhabiting salt-water marshes in western Maine to those in freshwater habitat along the Petitcodiac River and Kamouraska on the St. Lawrence. There is little doubt that *subvirgata* represents the closest eastern relative of the James Bay birds (*altera*) recently described by Todd (1938). I am not well enough acquainted with the northern representatives of *subvirgata* to know how closely they resemble *altera*. If *subvirgata,* indeed, is the closest race to *altera* it would be interesting to know where the area of intergradation occurs. Since the northern *subvirgata* are found in fresh-water marshes, it is possible that some colonies may be nesting inland along the southern portion of the Labrador Peninsula. This area, which extends about 500 miles from James Bay to the mouth of the St. Lawrence River, is studded with lakes and rivers and suitable marshes may be quite abundant.

A. c. caudacuta.—While collecting Acadian Sharp-tailed Sparrows (*A. c. subvirgata*) at Popham Beach, Maine, I took a breeding female *caudacuta* in the midst of a well populated colony of the former race. (Montagna, 1940) The discovery is not very remarkable when one realizes that 35 miles to the southwest, at Scarborough, *caudacuta* nests regularly. Some of the specimens of *subvirgata* from Popham Beach are definite intermediates between the two races, although the majority of them prove to be good *subvirgata*. So, then, the area between the two localities mentioned above may be considered the area of intergradation. In Maine, *caudacuta* has been found nesting only at Scarborough, Wells, and Kittery. In these places the habitat is much different from that found north of Scarborough. The marshes become more wide and spacious as one proceeds southward. So, with the widening of the marshes the birds become more common and more generally distributed, and along the New Hampshire coast they are found in good numbers. Griscom says, "One of the curious things about the Sharp-tailed Sparrow that is striking in my own field experience with every described form is that as you proceed northward the bird tends to become local. In a good salt marsh on the south shore of Long Island, for instance, Sharp-tails are ubiquitous and abundant. By the time you reach the coast of

Massachusetts north of Boston, enormous areas of salt marsh like Plum Island meadows, between Ipswich, Rowley, and Newburyport, for no known reason the Sharp-tail is not ubiquitous. There will be a colony here and there along the bank of some tidal creek, when for all you can see, the Sharp-tails might just as well as not be up and down the entire length of the creek."

Their numbers increase as one proceeds southward to Rhode Island, Connecticut, and New York. Along the New York coast, including Long Island, the birds are extremely abundant, and it does not seem extravagant to consider this state, in spite of its limited coast line, as the center of abundance of these birds. Here one finds the "mean" of the species. By "mean" I wish to point out that specimens of nesting birds taken from this general area are very typically colored *caudacuta,* which are not as dark as the race to the south, *diversa,* not as pale as the adjacent race to the north, *subvirgata,* not as brightly colored as the inland race, *nelsoni.*

Along the New Jersey coast Sharp-tailed Sparrows are very common. Stone (1909) lists the birds as "Abundant summer resident on the salt meadows of the coast and Delaware Bay. . . ." In June, 1940, Jim Fife and I found them common along the coast of Ocean County. They were especially abundant at Tuckerton, in the southern part of Ocean County. Yet, although apparently suitable marshes were found on Long Beach and Island Beach, our searches there were fruitless. Just south of Tuckerton on the vast marshes on the promontory which projects between Little Egg Bay and Great Bay they were found only in scattered numbers and never very far from the drainage ditches near the water. From Tuckerton we took a fine series of specimens.

These proved to be of unusual interest because among typical *caudacuta* are several birds which are referable to the southern race, *diversa.* These are ". . . dark highly colored . . ." birds (Bishop, 1901a), comparable to the birds from farther south. Some of the birds in this series are undoubtedly intermediates between the two races. I have not seen birds from Delaware Bay but they are, probably, *diversa.*

Ammospiza caudacuta diversa.—Hellmayr (1938) defines the breeding range of this race as "in the salt marshes of the Atlantic Coast of the United States from Maryland to North Carolina."

In late June and July, 1941, Jim Fife, H. Gordon Stevenson, Jr., and I surveyed the coast of Delaware, Maryland, Virginia, and North Carolina for nesting Sharp-tails. In Delaware we found no birds until we reached Lewes. They were not common, however, and we did not collect any. They were more numerous at Rehoboth Beach and at Bethany Beach. Birds collected from these localities are definitely of the race *diversa.* We proceeded southward from Bethany Beach, stopping at constant intervals along the vast uninterrupted stretch of marsh of the eastern coast of the Delmarva Peninsula. Not until we arrived at Saint George's Landing in northern Maryland did we find any more birds.

This was a colony of several hundred birds. Other Sharp-tails were found farther south at Cornfield Harbor and Ocean City. We came across no other colonies in Maryland.

In Virginia we found a populous colony in the northern portion of the state, at Chincoteague Island. These marshes were vast and birds could be found nearly everywhere among them. The fine series collected at this point represents our southernmost specimens.

From Chincoteague we went southward to Cape Charles, at the tip of the peninsula and we visited *all* of the marshes along the way. From Cape Charles we went across to Norfolk, then to Cape Henry, Virginia Beach and Back Bay without finding any Sharp-tailed Sparrows. We went on to North Carolina along the Currituck Sound, investigating the endless expanses of marsh all along the way. We then proceeded to Roanoke Island, the type locality of *diversa* (Bishop, 1901b). Here, at least, we expected to find nesting birds. But the marshes around Wanchese, the type locality, were all coarse and brown, and the vegetation was either entirely submerged or too dry. The island is perhaps seven miles long, and during the three days that we remained there we searched its marshes thoroughly. There were no Sharp-tailed Sparrows to be found, nor were there any on Pea Island, a marshy island not far from Roanoke. We went on down as far as the mouth of the Neuse River at the south end of Pamlico Sound. All this was fruitless. I am now convinced that there are no breeding Sharp-tailed Sparrows in North Carolina.

Bishop (1901b) lists specimens taken on May 10 and May 11 from Roanoke Island. It has been concluded from this that these birds were breeding birds. Yet, it must be remembered that Sharp-tails are notorious laggards in their migratory movements. Bishop himself did not believe that the birds nested there, and in a recent letter he tells me that "Roanoke Island does not show country suitable for the breeding of this species . . . but Pea Island does . . .," "1901 . . . was, I think, my first visit to Pea Island. Subsequent visits I made there on spring dates failed to give me any later birds, and I finally concluded the race did not breed there, but further north. But I failed to find it on Charles Island, Virginia, the spring I was there. . . ."

Investigation of the records of breeding Sharp-tails in Virginia convinces me that these birds are found only in the northern portion of that state, and that Chincoteague Island is either the southern or nearly the southern limit of breeding Sharp-tailed Sparrows. Rives (1889–1890) says of this bird in Virginia that it was a "rather common summer resident, and breeds at Cobb's Island." Yet, Dr. J. J. Murray tells me that they ". . . seem to be nonexistent or at least very rare on the Virginia coast except in the northern section." Dr. Murray goes on to tell me that Alexander Sprunt spent six weeks at Cobb's Island in the early summer of 1940 without finding any of these birds. In June 1941, Dr. A. A. Allen, William A. Wimsatt, and I searched the marshes of Hog

Island (adjacent to Cobb's Island), Rogue Island and Little Machipongo Island. No birds were found. H. H. Bailey (1913) calls attention to the fact that in Virginia these birds ". . . breed more abundantly along the salt marshes of the northwestern side of the Chesapeake Bay than on the Cape Charles Peninsula or coastal islands. . . ." Unfortunately, I have found no other references to the Chesapeake Bay region, and Mr. Bailey is very vague in his information. It is entirely possible, however, that appropriate marshes along the Bay harbor colonies of Sharp-tails.

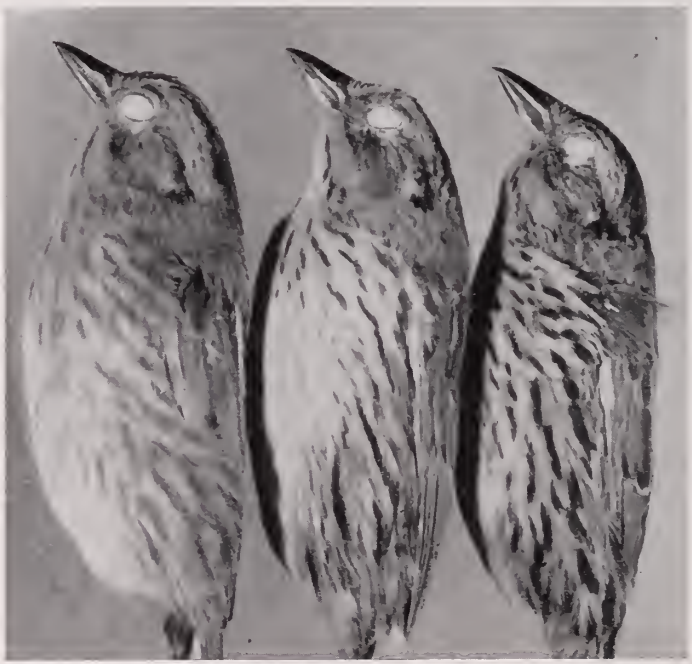

Figure 1. The three races of Sharp-tailed Sparrow that nest on the Atlantic coast. From left to right: *Ammospiza caudacuta subvirgata, caudacuta, diversa.* Note the increase in amount and sharpness of the streaking. (Photograph by Charles S. Brand.)

Ammospiza c. diversa, with its dark upper parts, is a well marked form. Realizing how really distinct the race is, one is rather surprised to find that it was not accepted by the A. O. U. Checklist, Fourth Edition. Oberholser (1931) defended the validity of this race, and I am sure that it will be generally accepted as it becomes better known.

Habitat

The study of the type of habitat chosen by these birds is interesting. The general character of the marshes is more or less similar for all three of the races, whether in Maine or Maryland. These marshes are usually well drained, although they may be subjected to slight daily flooding by tides. The tidal water must not, however, come above the base of the grasses since these birds build their nests on the roots of the thick

Figure 2. Dorsal view of the specimens of Figure 1. Same sequence. (Photograph by Charles S. Brand.)

mattings of grasses. The nests are suspended among the bases of the grasses only a few inches from the wet muck. To be sure, many of the nests are occasionally destroyed by sudden unusually high tides. Lewis (1920) in his study of the nesting of *subvirgata* in Nova Scotia makes interesting observations of the correlation of the height of spring tides and time of nesting. In closing he says "It would be interesting to know . . . if the birds, when nesting in salt marshes take into account the variation in the rise and fall of the tides. . ."

The Maine marshes, although they were restricted in area, offer an ideal condition for nesting. These were thoroughly and thickly covered by soft marsh grasses, the most common being *Spartina alterniflora, Spartina patens, Juncus Gerardi,* and *Triglochin maritima.* These marshes were flooded at high tide, but never did I find more than one or two inches of water where the birds were nesting.

Figure 3. Marsh near Popham Beach, at the mouth of the Kennebec River, Maine. This is typical habitat of the Acadian Sharp-tailed Sparrow. (Photograph by Ralph S. Palmer.)

The New Jersey marshes resembled those of the Maine coast. But the birds were nesting in slightly elevated "islands" scattered here and there along the immense marshland. These "islands" showed signs that they were occasionally slightly submerged, but they were comparatively dry, having a luxuriant growth of *Distichlis spicata,* and *Spartina patens,* whereas the surrounding muckier marshes had a sparser, coarser and taller vegetation with a predominance of *Scirpus* sp. and *Juncus Gerardi.* Yet, south of Tuckerton, along the drier marshes which extended miles in width no birds were found away from the shore. These marshes were possibly too dry. The birds preferred the slightly elevated "islands" toward the ocean side to all other habitats.

The marshes inhabited by Sharp-tails on the eastern side of the Delmarva Peninsula were well drained and green. The grasses were thick, soft, and seldom over a foot in height. At Chincoteague, Virginia, the habitat was most suitable and birds were very numerous.

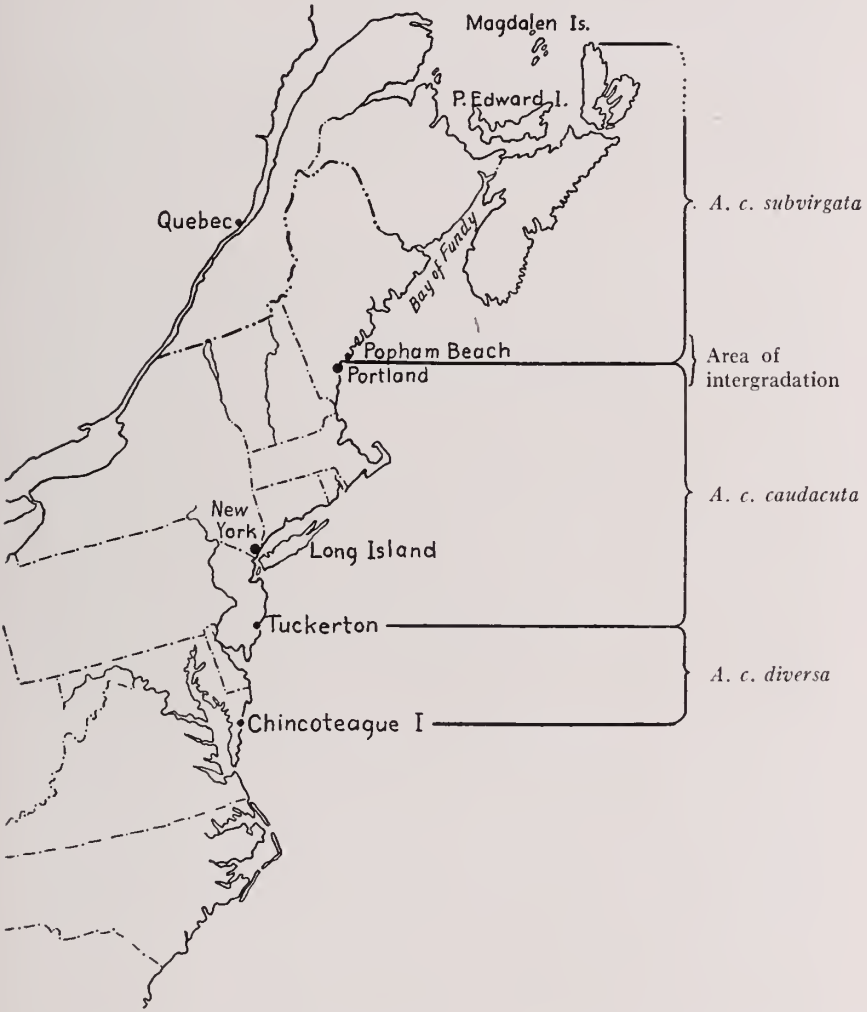

Figure 4. Map of the breeding ranges of the eastern Sharp-tailed Sparrows.

But again drainage alone did not seem to be the determining factor, for here and there were found large equally suitable areas devoid of birds. At Bethany Beach, Delaware, they were found along narrow strips

of marsh flanking the narrow tongues of sea which project inland. The birds were found only along the edge of the marsh toward the water or along the tidal pools close to the main bodies of water. These marshes were very restricted and became dry only fifty yards away, where elderberry (*Sambucus* sp.) was common. So, within 25 yards one found habitats suitable for Sharp-tails on the marshy side and Grasshopper Sparrows and Henslow's Sparrows on the dry land.

H. Godwin Stevenson, Jr. made the following list of the plant association found in marshes inhabited by Sharp-tails along the Delaware, Maryland, and Virginia coasts. *Distichlis spicata* (very abundant), *Spartina patens, Spartina glabra* (most abundant), *Scirpus americanus* and *S. robustus,* abundant.

It was evident that as one progressed southward the coastal marshes lost the meadowy appearance and became coarse, tall, and sparse. They were either submerged or entirely dried out. *Juncus Roemerianus,* a tall very coarse brown weed, was perhaps the predominant plant. Plants found dominant only where there were no Sharp-tails were *Salicornia europea* and *Eleocharis.*

Behavior of Breeding Birds

All of the three races of this species, with which I am familiar, are unusually quiet birds. With the exception of the "song" of the male, they utter short, retiring chips only infrequently. The Maine birds were the most frequent singers. A male bird would sing again and again; often within the area of one hundred square yards a dozen or more birds could be seen in the air, fluttering and descending, their song sounding like a gasp. In New York and New Jersey, however, the males were a little more quiet. I have watched these birds from the earliest hours of the morning to late evening, and only rarely could I see more than one bird in the air, and seldom could I hear more than three or four songs at one time, although male birds were all around me. The New Jersey birds had two distinct songs. One was the typical song of these birds, a hiss or gasp; the other resembled that of its close cousin, the Seaside Sparrow (*Ammospiza maritima*). The race *diversa* chirps more frequently than *subvirgata* and *caudacuta.* When they were feeding young they scolded occasionally at our intrusion and often, when we squeaked for them they chirped softly but repeatedly. Also, the occasional flight songs of *diversa* which I witnessed did not seem as spectacular as those of the other races to the north. The males rose only twenty or so feet in the air, uttering the song repeatedly, in the ascent as well as the descent. The song too, seemed to be harsher and more varied than that of *caudacuta* and *subvirgata.*

In Virginia when we flushed birds they often flew to a reed and began chipping softly. They were many times immediately assailed by

one or more birds which made their appearance from the grass. Together they often rolled to the ground in a tangled, fighting mass. There they remained fighting almost silently, often flapping, or perhaps chirping softly. In Maine, with *subvirgata,* I made observations somewhat like this. However, there I was able to confirm to my satisfaction that these were birds fighting over a female. With the southern birds there seemed to be a different story; twice I collected these "fighting" birds, none escaping, and they all proved to be males.

The diet of the southern Sharp-tails consists almost entirely of blackish spiders which are very abundant among the marsh grasses. The gizzards of birds collected were full of spiders and evidently the parent birds were feeding them to the young.

Winter Range

One of the interesting things about Sharp-tails is that all of the races may be found wintering together along the coast of the southern states. The most notable locality for their congregation is Amelia Island, Florida, where not only the three Atlantic Coast birds are found, but also the other two races of this species, the western inland form, *nelsoni,* and the James Bay one, *altera.* Sharp-tails winter from Massachusetts south to Florida, North Carolina and South Carolina being their centers of abundance.

Ammospiza caudacuta nelsoni.—I have examined several specimens unmistakably of this race from the Gulf Coast and Florida, as well as some from South and North Carolina. One bird from Cobb's Island, Virginia, marks the northernmost wintering locality known to me. The specimen was examined carefully and compared with breeding specimens from Minnesota. Since I have only scanty data, and the many sight records in the literature are of no value, I shall not try to interpret the migratory movements of this race. It will suffice to say that *nelsoni* does occur on the Atlantic coast, perhaps in greater numbers than has been realized.

Ammospiza caudacuta altera.—It is almost certain that many of the east coast birds which for the past years have been called *nelsoni* are actually *altera,* which Todd (1938) described from James Bay. There has been some discussion as to the validity of this race, and since Mr. Todd was good enough to show me his entire James Bay series I want to say that on the basis of these birds, contrasted with specimens from Saskatchewan, the race seems perfectly acceptable. Examination of a large number of migrant birds from Amelia Island, Florida, and Pea Island, North Carolina, convinces me that this race deserves recognition. Our series of locally collected specimens at the Cornell University Museum is made up almost entirely of young birds of this race. Sharp-tails are reported in Ithaca, New York, nearly every year, from September 23 to October 28. I am sure that should closer search be made these birds

would be found in some numbers in autumn along the inland marshes south of the Great Lakes. These birds are practically never recorded inland during the spring migration, and secretive as they are, they are not easily seen even on the coast. Harry Hathaway tells me that he has observed them in large numbers along the Long Island and New York coasts for many springs.

That *altera* winters at Amelia Island, Florida, Mt. Pleasant, South Carolina, and Dare County, North Carolina is substantiated by specimens. Doubtless some may be found wintering all along the coast as far north as New York.

Ammospiza caudacuta subvirgata.—It may be assumed that *subvirgata* migrates southward in the fall primarily along the coast. For lack of other evidence we must accept this, although I am of the opinion that these birds, which, in their nesting habitats show a transition from salt to fresh-water marshes, do not altogether follow the coast. I also believe that if careful search were made they would be found along our inland marshes. Two specimens in our Cornell University collection, collected by Louis A. Fuertes at Ithaca, are of this race. Burch (1897) took a bird in Yates County, New York, which Dwight identified as *subvirgata*. The literature is full of inland sight records, which one may doubt, but Dwight's identification of the Yates County specimen was doubtless correct. Also, Wetmore and Lincoln(1932) took a specimen somewhat inland at Cornfield Harbor. The main wave of migration occurs along the coast, where wintering *subvirgata* have been found from New York to Florida. The preferred wintering quarters are South Carolina and Florida.

Ammospiza caudacuta caudacuta.—These birds are strictly marine and have never, to my knowledge been reported inland. They proceed southward along the coast, a few of them wintering all along the breeding grounds. They have been reported wintering from Massachusetts to Florida. Their numbers in the winter increase from Virginia southward, being particularly abundant in the Carolinas and Florida. In April, 1941, William A. Wimsatt and I found them in fair numbers at Hog Island and Rogue Island, Virginia.

Ammospiza caudacuta diversa.—Specimens of this race taken from North Carolina prove that they winter there in abundance. They have been taken also from South Carolina, Georgia, and Florida, as far south as Amelia Island. In April, 1941, Wimsatt and I found three in the marshes of Hog and Rogue Islands, Virginia; *caudacuta* was far more common.

Relationship Between the Sharp-tail and Seaside Sparrows

Since these species live side by side in the salt marshes there would seem to be a natural competition for survival. However, as one begins to understand the birds' preference for habitat one realizes that such

competition is largely avoided; perhaps the only real rivalry between them is in their search for food, both species feeding on small aquatic and semi-aquatic arthropods. It is in their choice of nesting sites and territory that the two birds differ most markedly. I have already discussed the nesting of the Sharp-tails. The Seaside Sparrows nearly always place their nests on tussocks of grasses which are usually growing from shallow water, the nests being a foot or so from the level of the water. The coarse, brown, flooded marshes of southern Virginia and the Carolinas are the ideal habitat of Seasides, which may be found there in great numbers.

Generally speaking, the behavior of the two birds is similar. In New Jersey I witnessed Seasides fluttering up into the air in the manner of the song-flight of the Sharp-tails. This behavior was observed again in North Carolina. It was not a true song-flight like that characteristic of the other species, but there is enough similarity to remind one of it.

I have often wondered about the more intimate relationships of these birds. They resemble each other in general appearance and in their habits. I had rather hoped that with extensive collecting I might some day take a bird which showed signs of intergradation between the two species. In June, 1940, at Tuckerton, New Jersey, I collected a male Sharp-tail and a female Seaside while they were in copula on a tussock of grass.

Summary

The Acadian Sharp-tailed Sparrow, *Ammospiza caudacuta subvirgata,* is found nesting as far north as Kamouraska on the Gulf of St. Lawrence, and there are sight records even from the Magdalen Islands. This race breeds southward all along the coast to Popham Beach, Maine, where intermediates with *caudacuta* are found. *A. c. caudacuta* breeds from Portland, Maine, to southern New Jersey, becoming particularly abundant along the coast of New York, and especially Long Island. Tuckerton, New Jersey, is in the area of intergradation of this race with *diversa. A. c. diversa* breeds south of Tuckerton, New Jersey, in the marshes of the Delaware Peninsula, and along the coast of Delaware, Maryland, and northern Virginia, to Chincoteague Island. This is the southernmost known locality of their breeding distribution.

New York is without doubt the center of breeding abundance of this species. As one progresses northward and southward the birds become more local in their distribution.

All the five races of the species may be found wintering along the Atlantic Coast. Their wintering range extends from Massachusetts to Florida, North Carolina and South Carolina being the centers of abundance. *A. caudacuta nelsoni* has been found in the winter from Cobb Island, Virginia, to Florida; *altera* is found regularly from New York City to Amelia Island, Florida; *subvirgata* has also been reported in

New York, and south to Amelia Island, Florida. Typical *caudacuta* may winter all along its breeding range, south to Amelia Island. This race is often recorded from Massachusetts. *A. caudacuta diversa* winters south from Hog Island, Virginia, to Amelia Island, Florida.

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To the Editor of the Wilson Bulletin:

Now that fourteen of my Bulletins on the "Life Histories of North American Birds" have been published, your readers may be interested to know what progress is being made on future volumes.

The manuscript for the fifteenth, on the Corvidae and Paridae, has long since been completed and is in the hands of the publishers in Washington.

My work on the sixteenth, containing the birds on the 1931 Checklist from the nuthatches to the thrashers inclusive, is practically done, except for a few minor details.

I am now starting work on the seventeenth volume, which is planned to include the birds on the 1931 Check-list from the thrushes to the vireos inclusive.

It is planned to accumulate manuscript in advance of publication, which may be retarded under the present war conditions.

I wish to take this opportunity to thank all those who have contributed material for previous volumes, to remind them that this is a co-operative work, and to ask them to send me, as soon as possible, contributions of notes, data and photographs relating to birds to be included in the seventeenth volume; the sooner these are received, the easier it will be for me to use them.

140 High Street, Sincerely yours,
Taunton, Mass. A. C. Bent

FLIGHT AND RUNNING SPEEDS OF BIRDS

BY CLARENCE COTTAM, CECIL S. WILLIAMS AND CLARENCE A. SOOTER

ONE of the chief characteristics and most fascinating accomplishments of birds is their remarkable degree of mobility. This quality undoubtedly has had high survival value in their evolution. Obviously, there is great variation among individuals of a species or even within the same flock or covey. As might also be expected, there is a vast difference between the normal cruising and feeding speed and the maximum speed; each of these probably varies under a wide range of conditions. In addition to the will for speed at any particular moment, wind direction and velocity, angle of flight in relation to the earth, the age and physical condition of the bird, the state of its plumage, and other factors modify the speed of the bird.

The topics of flight speed, altitude attained, and the mechanics or aeronautics of flight have already been the subject of considerable conjecture and observation. Specific data on flight and running speeds may prove of value to the investigator of predator-prey relationships. The subject of flight speed is best summarized by May Thacher Cooke in U. S. Department of Agriculture Circular No. 428, entitled "Flight Speed of Birds", issued in May, 1937. Relatively few running speeds have been recorded.

In the course of field work in various parts of the West, we have been able to time a number of birds whose flight or running speeds have never been recorded and to add to the rather limited data on record for others. All records were made by automobile, from which two or more observers usually checked the speeds. Our data are summarized in Tables 1 and 2. The bird names used are those of the A.O.U. Checklist (1931).

TABLE 1

FLYING SPEED OF BIRDS

Species	Miles per hour	Place	Date	Distance covered	Observer	Remarks
Double-crested Cormorant	22	Malheur Refuge, Oregon	6/29/41	200 yds.	C. C. C. S. W. C. A S.	Cruising
Great Blue Heron	18, 24, 25, 29	Bear River Bird Refuge, Utah	7/21-24/41	200 yds.	C. C. C. S. W.	Cruising
Great Blue Heron	36	Bear River Bird Refuge, Utah	7/26/41	200 yds.	C. C. C. S. W.	No favoring wind, bird pressed
Great Blue Heron	20	Malheur Refuge, Oregon	7/21/41		C. C. C. S. W. C. A. S.	Cruising
Black-crowned Night Heron	20	Malheur Refuge Oregon	6/29/41	200 yds.	C. C. C. S. W. C. A. S.	Cruising
Black-crowned Night Heron	18	Malheur Refuge, Oregon	10/13/41	450 yds.	C. A. S.	No wind; 3 juveniles
Black-crowned Night Heron	35	Bear River Bird Refuge, Utah	7/23/41		C. C. C. S. W.	Paralleling car; being pressed some
Snowy Egret	30	Bear River Bird Refuge, Utah	7/23/41		C. C. C. S. W.	Bird pressed
White-faced Glossy Ibis	30, 33	Bear River Bird Refuge, Utah	7/21/41		C. C. C. S. W.	Cruising
Whistling Swan	25	Currituck Sound, North Carolina	Nov. 1933	450 yds.	C. C.	Six birds flying 18 to 25 miles per hour

Canada Goose	20	Currituck Sound, North Carolina	Nov. 1933	200 yds.	C. C.	Cruising, easy flight
Canada Goose	26	Bear River Bird Refuge, Utah	7/21/41	200 yds.	C. C. C. S. W.	In front of car
Mallard	40	Bear River Bird Refuge, Utah	7/21/41	200 yds.	C. C. C. S. W.	Bird being pressed
Gadwall	29	Malheur Refuge, Oregon	6/29/41	200 yds.	C. C. C. S. W. C. A. S.	Cruising
Baldpate	22	Malheur Refuge, Oregon	6/29/41	100 yds.	C. C. C. S. W. C. A. S.	Gliding to alight
Pintail	49	Bear River Bird Refuge, Utah	7/26/41	½ mile	C. C. C. S. W.	Juvenile, being pressed
Green-wing Teal	30, 40	Bear River Bird Refuge, Utah	9/14/41	½ mile	C. C. C. S. W.	Cruising and being pressed, respectively
Cinnamon Teal	50	Bear River Bird Refuge, Utah	7/23/41	½ mile	C. C. C. S. W.	Male; being pressed
Cinnamon Teal	33	Malheur Refuge, Oregon	6/29/41	200 yds.	C.C. C. S. W. C. A. S.	Cruising
Shoveller	25	Malheur Refuge, Oregon	6/29/41	200 yds.	C. C. C. S. W. C. A. S.	Not exerting itself
Shoveller	50	Bear River Bird Refuge, Utah	9/17/41	200 yds.	C. C. C. S. W.	Pressed
Redhead	45	Bear River Bird Refuge, Utah	9/14/41	200 yds.	C. C. C. S. W.	Pressed, but attempting to light; erratic flight
Redhead	50, 55	Bear River Bird Refuge, Utah	7/23/41	200 yds.	C. C. C. S. W.	Pressed

Species	Miles per hour	Place	Date	Distance covered	Observer	Remarks
Redhead	31	Bear River Bird Refuge, Utah	7/23/41		C. C. C. S. W.	Cruising
Redhead	50, 51	Bear River Bird Refuge, Utah	7/26-28/41		C. C. C. S. W.	Female; being pressed
Buffle-head	48	Bear River Bird Refuge, Utah	10/24/41	3 miles	C. S. W.	Three females
Buffle-head	40	Malheur Refuge, Oregon	12/12/41		C. A. S.	Slight cross wind hindering flight (Blitzen River)
Sharp-shinned Hawk	28	Malheur Refuge, Oregon	10/3/41	525 yds.	C. A. S.	No wind
Cooper's Hawk	28	Bear River Bird Refuge, Utah	9/14/41	100 yds.	C. C. C. S. W.	Female
Ferruginous Roughleg	30–35	Red Rock Refuge, Montana	9/16/41	450 yds.	C. C. C. S. W.	
Prairie Falcon	30	Malheur Refuge, Oregon	11/8/41	175 yds.	C. A. S.	No wind
Osprey	25–27	Parramore Island, Virginia	8/23/35	450 yds.	C. C.	Flying along beach
Duck Hawk	40	Bear River Bird Refuge, Utah	7/21/41		C. C. C. S. W.	Cruising
Sparrow Hawk	30–39	Warner Valley, Oregon	6/30/41	200 yds.+	C. C. C. S. W.	Cruising
Sharp-tailed Grouse	28, 30, 33	Des Lacs, North Dakota	7/28/41	50 yds.+	C. C. R. G.	
Sharp-tailed Grouse	22	Faith, South Dakota	8/18/41		R. G.	

Sage Grouse	28	Alturas, California	7/2/41	50 yds.	C. C. C. S. W.	Flushed, flying in front of car
Sandhill Crane	31	Malheur Refuge, Oregon	3/18/41	700 yds.	C. A. S.	Fair breeze hindering flight
Sandhill Crane	35	Malheur Refuge, Oregon	8/22/41		C. A. S.	No wind
Western Snowy Plover	30	Bear River Bird Refuge, Utah	7/21/41		C. C. C. S. W.	Apparently cruising speed
Killdeer	25	Malheur Refuge, Oregon	6/29/41	50 yds.	C. C. C. S. W. C. A. S.	Flying zigzag
Long-billed Curlew	50	Bear River Bird Refuge, Utah	6/26/41	450 yds.	C. C. C. S. W.	Flying in front of car
Long-billed Curlew	35, 40, 45	Malheur Refuge, Oregon	6/29/41	100 to 200 yds.	C. C. C. S. W. C. A. S.	No exertion in evidence
Spotted Sandpiper	23	Malheur Refuge, Oregon	6/29/41	50 yds.	C. C. C. S. W. C. A. S.	Apparently cruising
Spotted Sandpiper	21, 25, 30	Bear River Bird Refuge, Utah	7/21/41		C. C. C. S. W.	Apparently cruising
Western Willet	35, 39, 40	Bear River Bird Refuge, Utah	7/21/41	50 to 200 yds.	C. C. C. S. W.	
Western Willet	45, 47	Bear River Bird Refuge, Utah	7/23-24/41	200 yds.	C. C. C. S. W.	Small flocks of 3 and 12 birds
Forster's Tern	10	Bear River Bird Refuge, Utah	7/24/41	200 yds.	C. C. C. S. W.	Cruising
Common Tern	28	Parramore Island, Virginia	8/23/35		C. C.	Cruising along ocean beach

Species	Miles per hour	Place	Date	Distance covered	Observer	Remarks
Black Tern	21, 23	Malheur Refuge, Oregon	6/29/41	100 yds.	C. C. C. S. W. C. A. S.	Cruising
Black Tern	10	Bear River Bird Refuge	7/24/41	50 yds.	C. C. C. S. W.	Cruising
Black Skimmer	10	Parramore Island, Virginia	8/23/35	200 yds.	C. C.	Cruising
Black Skimmer	30	Parramore Island, Virginia	8/23/35	200 yds.	C. C.	Flock of 12
Great Horned Owl	40+	Malheur Refuge, Oregon	10/27/41		C. A. S.	Slight wind aiding flight
Burrowing Owl	12	Malheur Refuge, Oregon	6/29/41	40 yds.	C. C. C. S. W. C. A. S.	Cruising or feeding flight
Short-eared Owl	15, 19, 25	Malheur Refuge, Oregon	6/28–29/41	20 to 50 yds.	C. C. C. S. W. C. A. S.	No wind
Short-eared Owl	26	Malheur Refuge, Oregon	10/7/41		C. A. S.	No wind
Red-shafted Flicker	28	Malheur Refuge, Oregon	6/29/41	50 yds.	C. C. C. S. W. C. A. S.	Cruising; no wind
Red-shafted Flicker	27	Malheur Refuge, Oregon	11/20/41		C. A. S.	
Red-shafted Flicker	28	Malheur Refuge, Oregon	12/6/41		C. A. S.	

Red-shafted Flicker	29	Upper Souris, North Dakota	7/28/41	400 yds.	C. C.	Cruising
Violet-green Swallow	28	Malheur Refuge, Oregon	6/29/41	50 yds.	C. C. C. S. W. C. A. S.	Cruising in zigzag
Cliff Swallow	29	Malheur Refuge, Oregon	6/29/41	50 yds.	C. C. C. S. W. C. A. S.	Cruising in zigzag; 2 separate records
American Magpie	20	Malheur Refuge, Oregon	10/9/41		C. A. S.	Favored by wind
American Magpie	22	Malheur Refuge, Oregon	10/13/41	250 yds.	C. A. S.	No wind
American Magpie	22	Malheur Refuge, Oregon	11/7/41	175 yds.	C. A. S.	No wind
Western Raven	35	Malheur Refuge, Oregon	7/23/41	100 yds.	C. C. C. S. W. C. A. S.	Flying along dike.
Western Raven	39	Red Rock Refuge, Montana	9/16/41		C. C. C. S. W.	
Crow	30	Red Rock Refuge, Montana	9/16/41		C. C. C. S. W.	Small flock
Sage Thrasher	29	Bear River Bird Refuge, Utah	7/21/41		C. C. C. S. W.	Cruising
Sage Thrasher	22	Warner Valley, Oregon	6/30/41	100 yds.	C. C. C. S. W.	
Sage Thrasher	25, 28	Malheur Refuge, Oregon	6/29/41	100 yds.	C. C. C. S. W. C. A. S.	Flying erratically in front of car
Western Robin	25	Malheur Refuge, Oregon	11/5/41	175 yds.	C. A. S.	No wind

Species	Miles per hour	Place	Date	Distance covered	Observer	Remarks
Mountain Bluebird	18	Malheur Refuge, Oregon	12/6/41	Short distance	C. A. S.	Cross wind
Townsend's Solitaire	20	Malheur Refuge, Oregon	3/9/41	350 yds.	C. A. S.	No wind
Sprague's Pipit	28	Des Lacs Refuge, North Dakota	7/28/41	30 yds.	C. C.	In front of car
California Shrike	22	Malheur Refuge, Oregon	11/30/41		C. A. S.	
Yellow Warbler	22	Mud Lake Refuge, Minnesota	8/23/41		C. C.	Easy flight.
Western Meadowlark	26	Red Rock Refuge, Montana	9/16/41		C. C. C. S. W.	
Yellow-headed Blackbird	29	Upper Souris, North Dakota	7/29/41		C. C. R. G.	Single bird
Yellow-headed Blackbird	25	Bear River Bird Refuge, Utah	7/21/41		C. C. C. S. W.	Single bird
Yellow-headed Blackbird	20	Malheur Refuge, Oregon	6/29/41	75 yds.	C. C. C. S. W. C. A. S.	Cruising
Yellow-headed Blackbird	30, 35	Bear River Bird Refuge, Utah	7/23/41	350 to 700 yds.	C. C. C. S. W.	75 birds in flock. Cruising
Brewer's Blackbird	29	Bear River Bird Refuge, Utah	7/21/41		C. C. C. S. W.	
Brewer's Blackbird	28	Warner Valley, Oregon	6/30/41	100 yds.	C. C. C. S. W.	Cruising
Savannah Sparrow	23	Bear River Bird Refuge, Utah	7/21/41		C. C. C. S. W.	Cruising

Savannah Sparrow	27	Malheur Refuge, Oregon	6/29/41	100 yds..	C. C. C. S. W. C. A. S.	In front of car
Savannah Sparrow	21	Malheur Refuge, Oregon	6/28/41	About 100 yds.	C. C. C. S. W. C. A. S.	Three separate records
Savannah Sparrow	20–21	Currituck Sound, North Carolina	Nov., 1935		C. C.	Cruising
Shufeldt's Junco	26	Malheur Refuge, Oregon	12/3/41	Short distance	C. A. S.	
Modoc Song Sparrow	30	Malheur Refuge, Oregon	10/3/41		C. A. S.	No wind

C. C. —Clarence Cottam
C. S. W.—Cecil S. Williams
C. A. S.—Clarence A. Sooter
R. G. —Richard Griffith

TABLE 2

RUNNING SPEED OF BIRDS

Species	Miles per hour	Place	Date	Distance covered	Observer	Remarks
Sage Hen	2	Near Alturas, California	7/2/41	30 ft.	C. C. C. S. W.	In road, immediately front of car
European Partridge	9	Malheur Refuge, Oregon	6/29/41	30 yds.	C. C. C. S. W. C. A. S.	On dike road, in front of car
Chukar Partridge (*Alectoris graeca*)	12	Lower Souris, North Dakota	8/2/41	20 yds.	C. C. R. G.	In front of car
Chukar Partridge	18	Missouri	June 1939		H. D.	Field report of Missouri Cooperative Unit
Gambel's Quail	11	Kofa Refuge, Arizona	7/10/41	30 yds.	C. C.	In road in front of car, covey of 14, not quite grown
Gambel's Quail	14	Kofa Refuge, Arizona	7/10/41	20 yds.	C. C.	Female adults, in road in front of car; pressed
Ring-necked Pheasant	8–10	Malheur Refuge, Oregon	6/28/41	200 yds.	C. C. C. S. W. C. A. S.	Two males, in weedy road on dike between ponds; pressed
Ring-necked Pheasant	10	Lake Bowdoin Refuge, Montana	7/25/41	100 yds.	C. C. R. G.	In soft dirt road; pressed but speed obviously impeded
Ring-necked Pheasant	10, 12, 15, 21	Lower Souris, North Dakota	8/2/41	50 to 100 yds.	C. C. R. G.	Single birds; in road in front of car; pressed
Ring-necked Pheasant	12	Bear River Bird Refuge, Utah			E. R. Q.	Immature, 2/3 grown

Ring-necked Pheasant	8–12	Camas Refuge, Idaho	9/16/41	30 yds.	C. C. C. S. W.	Immature, 2/3 grown; in front of car
Killdeer	5	Las Vegas, Nevada	7/4/41	30 ft.	C. C.	On dike between two ponds; in front of car
Long-billed Curlew	8	Bear River Bird Refuge, Utah	6/26/41	30 ft.	C. C. C. S. W.	Immature, bird of the year; in front of car
Long-billed Curlew	8–10	Bear River Bird Refuge, Utah	6/29/41	75 yds.	C. C. C. S. W.	Adult, on dike between two lake units; in front of car, pressed
Avocet	8	Bear River Bird Refuge, Utah	6/29/41	50 ft.	C. C. C. S. W.	Adult, on dike between two lake units; in front of car, pressed
Road-runner	12	20 miles south of Phoenix, Arizona	7/11/41	50 yds.	C. C. J. A. N.	In very deep soft silt in road in front of car; pressed
Road-runner	15	Near St. George, Utah	9/5/26	300 yds.	C. C.	Up 3 per cent grade, dirt road; pressed

C. C. —Clarence Cottam
C. S. W.—Cecil S. Williams
C. A. S. —Clarence A. Sooter
R. G. —Richard Griffith
H. D. —Hugh Denney
E. R. Q.—Erling R. Quortrup
J. A. N.—Johnson A. Neff

U. S. Fish and Wildlife Service, Washington, D. C.

NOTES ON THE MIGRATIONS OF THE ELF AND FLAMMULATED SCREECH OWLS

BY ALLAN R. PHILLIPS

WHILE gathering information on the birds of Arizona, I found in 1937 that winter records for certain owls were few or lacking. When this was mentioned to Mr. E. C. Jacot, who is thoroughly familiar with Arizona night birds, he expressed the opinion that two of these owls did not winter within the state. Further inquiry establishes at least a high degree of probability that Jacot's views are correct. These two very migratory owls are discussed below.

In addition to the literature, I have drawn upon information from the following sources: U. S. Fish and Wildlife Service, U. S. National Museum, Field Museum of Natural History, American Museum of Natural History, and the private collection of Dr. L. C. Sanford, University of Utah, University of Arizona, and Arizona State Museum. Mr. J. Frank Cassel kindly supplied data on specimens in the Academy of Natural Sciences of Philadelphia, and Mr. J. Southgate Y. Hoyt on those in the Museum of Comparative Zoology at Harvard College. I wish to express my appreciation to these gentlemen and to the authorities of these institutions.

Elf Owl (*Micropallas whitneyi*)

Though repeatedly sought, this owl has never been authentically recorded in winter in southern Arizona; it is probably the most numerous of all owls there in summer. A. B. Howell (1916: 211) long ago questioned its wintering there, yet most ornithologists continue to think of it as a resident species.

Three races are currently recognized. Since these do not seem to have the same migratory behavior, it is advisable to consider each separately. *Micropallas whitneyi sanfordi* of Baja California appears to be resident, though further data are desirable. It does not seem to be an especially rare bird.

M. w. idoneus of extreme southern Texas is a rare bird whose status requires further elucidation. As far as I know, the earliest spring record is March 14, 1894, at Brownsville (specimen in Philadelphia Academy of Natural Sciences, fide J. F. Cassel). This date agrees well with the arrival of Elf Owls in southern Arizona and therefore provides no evidence that the species winters in Texas.

The great bulk of our knowledge of the species has been obtained in central southern Arizona, with whose saguaro (giant cactus) country we have long associated it. However, it is by no means restricted to that association. Jacot has found it common in the Huachuca Mountains in the oak belt, and various others have reported it in the same association

in other mountains. In fact, from the live oak belt downward, it apparently breeds wherever there are suitable nesting holes in central southern Arizona.

In this area of abundance, numbers of Elf Owls have been taken from late March to June, and others in the summer months and as late as the first week of October. The latest record seems to be Oct. 10, 1885, at Tucson (one ♀ in Arizona State Museum, taken by Herbert Brown).

Spring return seems to occur usually in early March. The earliest date is February 25, 1940, when I took near Tucson a male which was prepared by Lyndon L. Hargrave and is now in my collection. Probably they arrive regularly the last of February or first of March, although the next certain record seems to be March 12, 1908, at Campbell's Ranch on the Rillito (reported by H. H. Kimball to Fish and Wildlife Service). On both March 16 and 17, 1938, I noted several near Tucson, and three specimens were secured in an hour's collecting on March 16; in view of the number seen, I believe that they had probably arrived some days previously.

The available data, then, show clearly that the southern Arizona Elf Owls migrate to an unknown winter home in early October and return in early March. The male (Fish and Wildlife Service collection) taken by E. W. Nelson at Tehuacan, Puebla, May 4, 1893, furnishes some evidence that the species breeds at least that far south; otherwise the males would probably have migrated north long before that date. I have seen no other dated specimens from southern or central Mexico. Whether the species migrates south out of its breeding range or merely withdraws into the southern part of it awaits discovery.

Flammulated Screech Owl (*Otus flammeolus*)

Swarth (1904: 9) long ago stated that this owl was "quite a common migrant" in late April and early May in the Huachuca Mountains, Arizona. Jacot (1931: 10) failed to find it in winter in those mountains. Swarth also (1914: 30) regarded it as a "summer visitant" only, in Arizona. Nevertheless, current literature still treats this owl as a resident, non-migratory bird. This treatment is not justified by the facts. As far as I can ascertain, all but one of the definitely dated records for the United States and Canada fall between April 11 and October 31. Dates of interest, arranged by states and provinces, are as follows:

British Columbia.—The "dilapidated specimen" picked up in November, 1902, at Penticton (Brooks, 1909: 61) hardly constitutes a satisfactory date of occurrence.

Oregon.—Extreme dates are April 30, 1939, at the Malheur Refuge to October 15, 1940, in the Steens Mountains (both dates reported to the Fish and Wildlife Service by Refuge Manager J. C. Scharff).

California.—The male reported (Stephens, 1902) as taken north-

east of San Bernardino, January 18, 1885, by Forest Ball, I regard as probably casual. Mr. Hoyt kindly checked the original label on the specimen at Cambridge and found that it confirmed the date. The latest date otherwise is October 31, 1935, at Davis (Emlen, 1936).

Idaho.—The latest date is Sept. 28, 1914, near Coeur d'Alene (Rust, 1915: 125), but it probably stays later. The supposed egg with "incubation well begun" (Short, 1904) taken April 25, 1901, near Meridian was very doubtfully identified; it is questionable whether the birds even *reach* Idaho before April 25.

Utah.—The latest date is October 26, 1934, at Salt Lake City (Woodbury, 1939: 158).

Colorado.—The latest date is October 4, 1894, at Breckenridge (Cooke, 1900: 206), but it doubtless stays later. The supposed "March" record (Ridgway, 1877: 210), based on a skin in the Maxwell collection, I consider unsatisfactory since the data given by Ridgway on this collection have sometimes proved erroneous.

Texas.—Earliest of the few records is April 19, 1890, in Presidio County (Oberholser, 1899). Date secured from the specimen in the Fish and Wildlife Service collection.

New Mexico.—Recorded from April 11 and 15, 1887, at Mimbres (skins in Field Museum) to October 19, 1909, in the Mogollon Mountains (Bergtold, 1912: 332).

Arizona.—April 13, 1935 (vague statement by Jenks and Stevenson, 1937: 88), or April 14, 1930, in the Huachuca Mountains (Jacot, 1931: 11) is the earliest valid date.

It thus appears that the Flammulated Screech Owl arrives in the western United States generally in middle or late April and remains until late in October. What, then, is its status in Mexico? Here we lack detailed data. The species evidently winters north at least to Mount Orizaba and breeds south to Las Vigas, Veracruz, but the great majority of records lack exact dates.

The discovery of the extent of the migrations of this owl suggests the need for a review of its taxonomy and nomenclature. Kaup's original diagnosis is too brief to indicate the coloration of his specimen or specimens, but six years later (1859: 226) he described the species more adequately. Two specimens are mentioned but the first is described at greater length and must be considered the type. This was a gray bird and the name *flammeolus* is therefore correctly applied to a northern race. I suspect that all these gray individuals from southern Mexico and Guatemala (Ridgway, 1914: 730, footnote) are migrants. Kaup thought that his second bird was young, and his brief remarks that it was smaller and that the "rufous color predominates" indicate that it probably represented the local breeding race.

I know of no published evidence that this species breeds in Guatemala. The two dates seen are both in January. While I fully believe

that Griscom's *rarus* is a valid race, it is possible that it may breed only in southern Mexico. Moore and Peters (1939: 56) state that a specimen from the Valley of Mexico "resembles *rarus* closely, but shows a greater extension of cinnamon markings above and below." This hardly seems likely to prove constant when adequate series become available.

In this connection I have compared three especially critical specimens: a red male (Field Museum No. 19751) from Tecpam, Guatemala, January 7, 1906 (Dearborn, 1907: 84), believed to represent *rarus;* the breeding female (No. 7204, Louis Agassiz Fuertes Memorial Coll. of Cornell Univ.) from Las Vigas, Veracruz, April 4, 1939 (Sutton and Burleigh, 1940: 238); and a female (L. C. Sanford collection, No. 15768) taken by Jacot in the Huachuca Mountains, Arizona, June 5, 1922, which is the reddest United States specimen that I have seen. The Guatemalan bird, unfortunately, may not have reached fully adult plumage. In any case, it differs from the other two much as stated by Ridgway (1914: 729–730). It has an unstreaked pileum; warm brown sides of neck, back, rump, and tail; pale cinnamon tarsal feathers, cheeks, and upper sides; reduced and paler dark streaks and bars in underparts and in rear of auriculars; and less white in the head, the anterior white nuchal band being almost gone.

The Veracruz bird resembles northern birds in its heavy, dark crown-streaking and breast-penciling, but is in most respects intermediate. It is darker than the Arizona bird, probably only by individual variation. The anterior nuchal band is narrow but distinct. The tarsal feathering is cinnamomeous only proximally. This and the Arizona bird are quite similar dorsally.

The Sanford collection contains an excellent series from the inland southwest. These are mostly from the Huachuca Mountains, Arizona (April and May) and from Reserve, New Mexico (June, July, and September). The southern Arizona series is distinctly different from the more northern New Mexican birds, which are less rufescent, especially on the crown and the scapular spots.

A quite rufescent bird in the Sanford collection, taken by G. F. Breninger and without an exact date or original label, is marked as having been taken at Fresno, California. It agrees well with birds from the Huachuca Mountains, however, and I suspect that that is where it was really taken, as Breninger did considerable collecting there.

It is obvious that, in such a migratory and variable species, the material at present available is insufficient to settle the taxonomic and nomenclatural problems presented. The data at hand indicate that:

(1) The grayest birds are found in the western United States generally, south probably to central Arizona and central New Mexico. If the name *flammeolus* applies to the north Mexican race, these would become *O. f. idahoensis* (Merriam).

(2) Birds breeding from southern Arizona south are slightly redder.

The name *flammeolus* may or may not apply to these birds. Birds of the Sierra Madre Occidental may resemble either southern Arizona or southern Mexican birds, or may fall between the two.

(3) Birds breeding in southern Mexico are still redder, and may or may not be separable from *rarus*. Whether the latter breeds at all in Guatemala remains doubtful.

In connection with the migrations of the Flammulated Screech Owl it is interesting to note that Delacour (1941: 133–134) considers the races of this bird to be subspecies of the Old World *Otus scops*, whose northern forms are known to be migratory.

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The Wilson Ornithological Club Endowment Fund

The Wilson Ornithological Club feels the need of adding considerably to its present modest endowment. Such additional funds will increase the financial stability of the Club and will provide extra income which will enable us to enlarge the *Bulletin* and add to its attractiveness, thus insuring the maintenance of our standard of publication and keeping the *Bulletin* in the forefront of ornithological journals. The task of securing such funds has been assigned to the following committee:

Bernard W. Baker
Harold D. Mitchell
Olin Sewall Pettingill, Jr.
James B. Young
George B. Thorp, Chairman

The publication and distribution of the *Bulletin* is our most important contribution to ornithology, and absorbs the greater part of our income, which is at present almost entirely from dues. The committee plans to build up the Endowment Fund so that the extra income therefrom will enable us to attain the ends mentioned above. More illustrations, an occasional color plate, and more pages of text will greatly increase the appeal of the *Bulletin.* In turn, new members will be attracted, the subscription list will increase, and a healthy growth of both journal and club will result.

Such increase in endowment can come only from members of the Club and its friends. The committee believes that subscribing to a Life Membership constitutes the most satisfactory way for a member to assist in building up the fund. All money received from Life Memberships is automatically placed in the Endowment Fund. A Life Membership ($100) may be paid for in four annual instalments or in a lump sum, with credit for 1942 dues already paid. Though the Club's membership list totals about 1,100, there are but 10 Life Members, none having been added since 1929. We should have many times this number. Several members have already indicated their intention of backing the committee's efforts.

The committee will shortly make a direct personal appeal to all the members of the Club. But if you are already convinced of the value of the Club's contribution to ornithology and sound conservation, and are desirous of promoting cooperation and good fellowship among bird students, will you not anticipate the committee's direct appeal and send in your pledge to take out a Life Membership now or in the near future?

Endowment Committee

GENERAL NOTES

Avian Psychological Disturbance Resulting from Abnormal Coloration.—As a note supplementary to the discussion of this subject by Frances Hamerstrom in the issue of this journal for March, 1942 (*Wilson Bulletin*, 54: 33), it may be remarked that the psychological disturbance occasioned in certain flocks of birds by abnormal coloration of one of their number is recorded as having been noticed at least 2,550 years ago. In the Book of Jeremiah, chapter XII, verse 9, to which the date 608 B.C. is commonly attributed, the prophet states:

"Mine heritage is unto me as a speckled bird, the birds round about are against her."

The specific identity of the birds on which this remark is based is not indicated; it is not even known whether they were passerine birds. It is improbable that they were domestic fowls, for this prophecy preceded the carrying away of the Jews into Babylonian captivity (586 B.C.), while domestic fowls are not believed to have been introduced into Palestine until after the return from captivity, more than seventy years after the prophecy was made.—Harrison F. Lewis, *34 Grosvenor Avenue, Ottawa, Ontario.*

American Bittern Wintering in Michigan.—In the midst of a marsh near the town of Erie in the southeastern corner of Michigan there is a large spring of mineral water which keeps a pool unfrozen throughout the coldest winter. Here in mid-winter have been seen a number of birds that are uncommon in this season elsewhere in the region.

On March 1, 1942, John Stophlet and I found there an American Bittern (*Botaurus lentiginosus*) huddled, frozen, in a small depression. The body was emaciated. Apparently the bird had died since a snowfall of six days before. Louis W. Campbell has sight records of this species in the same location January 18, 1930, and February 18, 1933.—Harold F. Mayfield, *3311 Parkwood Avenue, Toledo, Ohio.*

Some New Water Bird Records for Kentucky.—Satisfactory records of water birds, notably Charadriiformes, in Kentucky are exceedingly few because of the limited amount of material that has been collected. Consequently we wish to record a heron, two shorebirds and a tern collected during 1941.

Yellow-crowned Night Heron (*Nyctanassa violacea violacea*).—A beautiful male of this species was taken by Mengel on June 29, 1941 at the extreme northern end of Reelfoot Lake in Fulton County, Kentucky. This bird appears to be the first preserved specimen for the state. L. O. Pindar (*Wilson Bulletin*, 37, 1925: 81–82) mentions a Yellow-crowned Night Heron "seen" dead in Fulton County, September 1, 1887. These herons were regularly present in small numbers at the north end of Reelfoot Lake during late June, 1941. The bird collected was fully adult but the gonads appeared somewhat reduced.

American Knot (*Calidris canutus rufus*).—In company with Mary Louise Fagley, Elizabeth Grawemeyer, and J. Frank Cassel, all of Cornell University, Mengel visited the Falls of the Ohio River near Louisville, Kentucky on August 28, 1941. Cassel promptly noticed a strange shorebird among the "peeps." It was collected and proved to be a male Knot in full fall plumage. So far as we know it represents the first occurrence of the species in Kentucky.

Baird's Sandpiper, *Pisobia bairdi*.—Monroe secured a specimen of this sandpiper on September 1, 1941 at the lower end of the Falls of the Ohio. There are several previous sight records for the Louisville area, (Monroe and Mengel, *Kentucky*

Warbler, 15 1939: 43) and some for Warren County (Gordon Wilson, *Kentucky Warbler,* 16, 1940: 19) but this specimen seems to be the first for the state.

Caspian Tern (*Hydroprogne caspia imperator*).—Caspian Terns bave been seen in the Louisville area in early fall for a number of years. (Monroe, *Auk,* 55: 678, 1938). The first specimen, however, was not secured until September 6, 1941 when Monroe killed one of several birds which had been about the Falls of the Ohio for some days. So far as we know, this is the first actual specimen for Kentucky.

All specimens mentioned are in the authors' collection at Anchorage, Kentucky.—Burt L. Monroe, *Louisville, Kentucky,* and Robert M. Mengel, *Cornell University, Ithaca, New York.*

Ducks following Bald Eagles.—Upon two occasions I in company with others witnessed ducks following or chasing Bald Eagles (*Haliaeetus leucocephalus*). On April 25, 1926, Cbarles F. Walker and I noted an eagle flying over the Huron Marsh, Huron County, Ohio. As the eagle flew over a flock of about 500 Pintails (*Anas acuta*) tbat were sitting on a pool in tbe marsb, the ducks arose and began to follow. The leaders of the flock quickly gained a position some 20 to 50 feet behind the eagle, witb the remaining ducks following their leaders in a long, sinuous flock. This flock followed tbe same route as did tbe eagle, and we observed no attempt by ducks in the latter part of tbe flock to "cut corners". As the eagle continued to circle and rise, the long, following flock did likewise, assuming some form of a hollow oval, circle, or "figure 8." Ducks approaching the eagle at lower elevations paid no apparent attention to it, but continued following their immediate leaders. Once the flock was formed, eacb duck closely maintained its relative position, and we noted no attempt of individuals to forge ahead, or of the leaders to attack the eagle. After a few minutes the eagle had gained several hundred feet in altitude, whereupon it dove downward at a moderate angle and with greatly accelerated speed, thus leaving behind its more slowly flying pursuers. When the ducks found themselves outdistanced they returned to the pool whence they came. At no time did tbe eagle attempt to molest the ducks. The flock was composed mostly of males, as April flocks of Pintails often are.

On February 6, 1942, my wife and I observed a similar performance. While watching an eagle flying over a flooded cornfield, in Monroe County, Michigan (about nine miles north of Sylvania, Ohio), we saw about 500 ducks arise from the field and begin to pursue the eagle. The eagle circled as described above, the ducks followed the eagle in the same flock formation and manner, the eagle outdistanced its pursuers by diving at a moderate angle after gaining altitude, and the ducks resettled in the cornfield. The latter flock was composed mostly of Black Ducks (*Anas rubripes*), together with a few Mallards (*A. platyrhynchos*). Both eagles were white-headed and white-tailed.

In both instances flock unity or solidarity of the ducks was outstanding. Apparently their behavior was analogous with the more frequently seen phenomenon of a dense, globular flock of Starlings flying above or behind a hawk. No attempt was made to strike the pursued, as Crows do.—Milton B. Trautman, *Stone Laboratory, Put-in-Bay, Ohio.*

Glaucous Gull in Oklahoma.—The Glaucous Gull (*Larus hyperboreus*) is primarily a bird of the Arctic or Sub-Arctic regions and rarely winters further south than northern California and New York. Relatively few even reach the Great Lakes. The species has apparently not been reported from Oklahoma.

On March 1, 1942, the authors, with Game Management Agents L. W. Merovka and Milton H. Boone, were met by Ranger Alfred Wensel of tbe Oklahoma State Game and Fish Commission, and by courtesy of the Commission were furnished a boat with which to inspect the wildlife resources of the recently impounded Grand River Reservoir in northeastern Oklahoma.

Near the state highway crossing the Reservoir west of Grove we observed two Glaucous Gulls along with some Ring-billed and a few Herring Gulls. The two northern gulls circled over our boat and came within 40 feet of us. Their very large size and completely white color made identification a simple matter. Because of their extreme white color and dark-tipped beak, it appeared that they were sub-adult, probably two-year-old birds. We watched them for about a half hour during the early forenoon and later the same day we saw one bird of the same species some 10 miles up stream from where the first pair were noted. Still later in the day we found another about 5 miles below the highway bridge. We suspect that the latter two birds were the same individuals seen earlier in the morning.—Seth H. Low, Richard E. Griffith, and Clarence Cottam, *U. S. Fish and Wildlife Service.*

Works of North American Ornithologists.—An abstract of a paper presented at the twenty-seventh annual meeting of the Wilson Ornithological Club states, "there has been no simple published account of the works of the men who have influenced North American Ornithology" (*Wilson Bulletin,* 54, March, 1942: 69).

What the word "simple" implies in this connection is problematical. If it were omitted, the statement would be recognized as unfounded. At the risk, in this period of youth movement, of seeming too devoted to records of the past, I would point out that aside from being treated in biographies by the hundreds, the works of men who have influenced North American ornithology have been by no means neglected by competent reviewers.

The author of the paper mentioned appears to be acquainted with the resume by Coues, but that is only one of several recapitulations. Witness:

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"During the first half of the present century Philadelphia stood pre-eminent in the American ornithological world. The large majority of our early ornithologists were Philadelphians, either by birth or residence."

The importance of bibliographical research can scarcely be over-estimated. A scientist should be wedded to the literature of his subject and as said of the ordinary marital relation, it will doubtless often prove that the partner is the better half.—W. L. McAtee, *Wildlife Service, Washington, D.C.*

An Unusual Nest of the Great Horned Owl.—A pair of Great Horned Owls (*Bubo virginianus*) was found nesting in an abandoned Crow's nest in a low cottonwood tree on the Valentine National Wildlife Refuge, Nebraska, in the spring of 1936. This nest was used by Great Horned Owls each spring during 1937, 1938, and 1939. It was almost completely worn out by the time the young owls left the nest in 1939. In fact, the two young were forced to rely for a perch, to a great extent, on the branches which supported the nest.

An artificial nest was substituted on the remains of the old nest in March 1940. This was constructed of ⅜ inch hardware cloth. It was circular, 18 inches in diameter with sides 5 inches high, as illustrated in the accompanying photograph.

Nesting material from an abandoned Crow's nest was placed inside the screen retainer. The nest was not used that spring. It is possible that another had been selected prior to the time the artificial one was substituted, but we were unable to discover any in the vicinity.

The man-made nest was used in 1941, and two eggs were laid during March. Two young owls were hatched and reared in this nest.—Ward M. Sharp, *Fish and Wildlife Service, Valentine National Wildlife Refuge, Valentine, Nebraska.*

Winter Records of the Mourning Dove and Band-tailed Pigeon in Washington.—The Western Mourning Dove (*Zenaidura macroura marginella*) has seemingly not been recorded as occurring in winter in the state of Washington, although Gabrielson and Jewett ("Birds of Oregon," 1940: 328) give several winter records for points in Oregon near the Washington line, and Bent (*U. S. Nat. Mus. Bull.*, 162, 1932: 413) lists casual winter records for Emmet and Gray, Idaho, and Okanagan Landing, British Columbia. Recently (*Murrelet*, 22, 1941: 60) I summarized the available records of the species in the western part of the state, listing April 7 and October 29 or 30 as extreme dates of arrival and departure. The occurrences described below are considered, therefore, as representing a first winter record for the state and a new early date for spring arrivals.

On January 13, 1942, while visiting the State Game Farm at Auburn, King County, Washington, I observed a single Mourning Dove. When first seen the bird was perched on a wire fence at the edge of a road near the farm buildings and was quite tame, allowing an excellent study with binoculars at distances of only 10 to 30 feet before it flew off. A few minutes later William Morrell and W. W. Wadkins of the farm volunteered the information that they too had noticed this bird, declaring it to be the first seen there for over two months and the first winter occurrence in their experience. On February 2, I again talked with them and learned that the bird had remained only "a day or two" before disappearing.

During a subsequent visit (March 20) Wadkins and Morrell stated that the single winter bird apparently never returned, but they reported that in the first week of March, about March 4, they saw six Mourning Doves on a telephone wire at the farm. This seems an unusually early date for spring arrival. Again, on March 30, Wadkins stated that perhaps five *pairs* were seen repeatedly about the farm from March 18 to 22. It so happened that on none of my visits after January 13 did I personally encounter the birds.

The occurrence of this "summer resident" following one of the coldest spells of December-January weather in recent years seems doubly unusual. It may be noted, however, that on December 29, during the height of the cold snap, I also recorded my first winter observation of Band-tailed Pigeons (*Columba f. fasciata*) in this state; on that date 26 were observed at close range in a Douglas fir top in Buckley Gulch at Tacoma. Subsequent identifications in the same area have been as follows: February 28 (10 birds, Jane M. Slipp), March 1 (10 birds), March 2 (25 birds), and March 7 (40 birds). In previous years my observations in this portion of the Puget Sound trough have yielded dates extending from March 27 to October 28, with main migratory flights apparently in April and September.—John W. Slipp, *University of Washington, Seattle.*

Bonaparte's Type of Passerculus anthinus.—A fair number of Bonaparte's and most of Du Bus' types are at the Musée Royal d'Histoire Naturelle de Belgique in Brussels, an institution which for some reason seems to have escaped visits by ornithologists interested in the systematics of American birds. Among the Bonaparte types is that of *Passerculus anthinus*, the racial identity of which has always been uncertain although guessed at with varying degrees of success. It is with considerable satisfaction, therefore, that I am able to record that the name accords with the diagnosis of Peters and Griscom in their recent review of the Savannah Sparrows(*Bull. Mus. Comp. Zool.*, 80, 1938, pp. 445–478) wherein they applied it properly to the slender-billed, grayish-brown race of the Alaska mainland in general, south to northern British Columbia. Whether or not the name *anthinus* applies to the breeding birds of Kodiak Island, the purported type locality, is another question and one concerning which I am certainly not going to express an opinion at this time.

Notes concerning the type, which was examined at Brussels in July, 1939, are herewith summarized. The bird is mounted on a conventional bar perch and in a fair state of preservation save for pronounced fade on the right side. The concealed portions of the plumage appear to be quite normal for the race at the age and season when collected, but the precise degree of fade is relatively unimportant in view of the characteristic bill and other measurements. The plumage is fresh post-juvenal with a few juvenal feathers evident among the upper and under tail coverts. There is no indication of sex other than that measurements suggest a male. They are as follows: wing, 71; tail, 52; exposed culmen, 9.7; depth from malar apex to base of culmen, 5.0; tarsus, 19.9; middle toe minus claw, 14.5 mm. There is no indication of typeship on the label except the locality "Kadiak" and the reference number 178. This the catalogue lists as "type du l'anthinus Bp.", with the notation that it came from the Du Bus collection. It is of interest to observe that a former specimen in the Museum collection proper is catalogued (789) as the "type du parvirostris Bp." with the notation that it had been destroyed and a further remark (translation) "this name probably unpublished. It was so written on the old stand by Bonaparte himself."

As to the type locality of *Passerculus anthinus,* I see no reason to doubt the one given, that is to say Kodiak Island, where the bird may well have been taken in migration.—A. J. van Rossem, *Department of Zoology, University of California, Los Angeles.*

Wilson Ornithological Club Library

The following gifts have been received recently:

Ralph Beebe—22 pamphlets and magazines
T. Hume Bissonette—3 reprints
Oscar M. Bryens—1 reprint
A. Sidney Hyde—30 magazines
Leon Kelso—1 pamphlet
Karl F. Lagler—7 pamphlets
Earl L. Loyster—1 pamphlet
Dayton Stoner—1 bulletin

EDITORIAL

Elsewhere in this issue is printed the appeal of the Club's Endowment Committee for more Life Memberships as a means of providing a much-needed increase in our endowment fund. To members who feel that they cannot take out Life Memberships just now, we would point out that any gift, however small, will be gratefully added to the endowment fund. One such gift has already been received and we hope it will be followed by many more. Won't you write to our Treasurer now and send a contribution?

This is the time of year when our members are most busy gathering the data that will fill some of the gaps in our knowledge of the breeding habits of birds. Sometimes in the past these efforts have, for lack of guidance, been partly wasted on poorly planned or inadequately recorded observations. Excellent suggestions on exactly what to look for and how best to record it have been published recently by Odum (*Oriole,* 6, 1941: 29–35) and Pitelka (*Auk,* 58, 1941: 608–612). It is really remarkable how incomplete are the files of such data for even the most common species of birds.

OBITUARY

Vernon Bailey, mammalogist and ornithologist, died in Washington, D.C., on April 20. He was one of the most skillful and experienced of field zoologists and had done pioneer work in many parts of America.

Benjamin T. Gault died at his home in Glen Ellyn, Illinois, on March 20 at the age of 83. He was perhaps most widely known for the section on the birds of Glen Ellyn which he contributed to Frank M. Chapman's great "Handbook." He had been a member of the Wilson Ornithological Club for 47 years.

C. Hart Merriam, founder and for twenty-five years Chief of the U.S. Bureau of Biological Survey, died on March 20 at the age of 86. He was a founder of the American Ornithologists' Union and later was elected its President. His "Life Zone" theory of plant and animal distribution greatly stimulated and guided bird distribution study in this country.

Edward R. Warren, noted Colorado naturalist, died on April 20. He had contributed extensively to our published information on mammals and birds, especially of Colorado.

Casey A. Wood, distinguished bibliographer and authority on the eyes of birds, died in La Jolla, California, on January 26.

ORNITHOLOGICAL NEWS

John T. Zimmer of the American Museum of Natural History has been appointed Editor of *The Auk.* The fourth to hold this distinguished office, he takes over the editing of volume 59 of the official organ of the American Ornithologists' Union.

Austin L. Rand has been appointed Assistant Zoologist of the National Museum of Canada in Ottawa. He will take charge of ornithology there upon the retirement this month of Percy A. Taverner.

F. L. Jaques spent part of April in Minneapolis, collecting materials and painting a background for a new habitat group of Blue and Snow Geese in the University of Minnesota Museum of Natural History.

WILDLIFE CONSERVATION

Conservation Note from Canada

There has been in recent years a notable increase in the numbers of Ring-billed Gulls and Caspian Terns nesting on islands in and near the east end of Lake Ontario. In 1941 at least five breeding colonies of Ring-billed Gulls were reported in that vicinity, four of them on islands in Lake Ontario and one on an island of the Thousand Islands group, in the upper St. Lawrence River. The largest of these colonies is reliably reported to have contained 3,200 nesting Ring-bills. In the same year observers reported two breeding colonies of Caspian Terns, the larger of which contained 100 nesting individuals, as being intimately associated with two of the Ring-billed Gull colonies.

All the colonies here referred to are in the province of Ontario, Canada, although one of them is within a mile of New York State and none, of course, is far from it. It seems very likely that similar colonies of one or both species exist on the New York side of the boundary.

Increase in the population of Ring-billed Gulls and Caspian Terns of Lake Ontario is attributed largely to continued protection of these species in both Canada and the United States in accordance with the terms of The Migratory Birds Treaty. —Harrison F. Lewis.

The Status of the White-winged Dove in Texas

The Eastern White-winged Dove (*Melopelia asiatica asiatica*), an important game bird in the southern tip of Texas, has decreased greatly in abundance during recent years as the Rio Grande delta has been more and more intensively cleared and farmed. The Texas Game, Fish and Oyster Commission has reported that as recently as the autumn of 1924 there were in the lower Rio Grande valley of Texas at least twenty major "flights" of these doves, the estimated population of which totalled four million or more individuals. During the autumn of 1941, State and Federal investigators estimated that fewer than 300,000 "white-wings" were present in the same area.

A joint Federal-State investigation of the status of this dove is now in progress, the principal objectives of which are to determine what can be and should be done to safeguard the future of White-winged Doves in Texas. The two cooperating agencies are the Division of Wildlife Restoration (Pittman-Robertson Division) of the Texas Game, Fish and Oyster Commission and the Fish and Wildlife Service. The investigation is to be completed this year (1942), and subsequently a report of findings and recommendations will be published.

The breeding range of the Eastern White-winged Dove on the mainland extends from Nicaragua northward through eastern Mexico to southeastern Texas. That part of Texas is also the northernmost limit of the types of woodland which this dove prefers for nesting habitat. For this and other reasons no large populations of breeding White-winged Doves are to be found north of the Rio Grande delta.

The doves arrive in April and May, nest from May into August, and leave for wintering grounds in southern Mexico and Central America, especially in El Salvador, from August until late October. During 1940 and 1941 more than four thousand nestling White-winged Doves were banded in Texas. Of these there have been many returns during the hunting season from within a radius of less than one hundred miles. Seven of these banded birds have been reported from a much greater distance; of these, five were taken in El Salvador, one in Guatemala, and one in Mexico approximately 100 miles south of Tampico.

Sufficient research has already been completed to indicate that the three principal limiting factors are (1) the great reduction in acreage of nesting grounds due to the clearing of woodland to provide agricultural land, (2) the reduced production of young due to loss of eggs and young to predators, and (3) the heavy kill during the hunting season.

The present status of the subspecies is not one to cause optimism. Both the acreage of nesting grounds and the production are factors difficult to control. Approximately 500,000 acres of potential nesting cover in Texas have been destroyed during the last twenty years. The high cost of land makes the acquisition of refuge expensive. Eggs and small young eaten by Great-tailed Grackles and Green Jays comprise the bulk of predation, according to studies made during the past two summers. In several small colonies more than 90 per cent of the eggs laid by White-winged Doves were eaten by predators. Records of one major colony show that 5.7 eggs were laid for each fledged young produced during the nesting season. Present information is that most pairs attempt to raise two broods, two young per brood, but because of losses through predation they average slightly less than two fledglings raised to flying age during the summer. Preliminary investigation has not been sufficient to indicate a practicable method for control of predators.

Hunting pressure, however, can be regulated. In 1941, for example, the open season in the lower Rio Grande Valley was limited by drastic changes in State and Federal regulations to five half-days (September 16, 18, 21, 23 and 25, afternoons only). This was a radical change from the 1940 season which provided for shooting on four days a week (Tuesday, Thursday, Saturday and Sunday) between September 15 and November 15, for a total of 35 shooting days.

In the Rio Grande delta the majority of the White-winged Doves nest in colonies ranging in size from a few pairs to a few thousand pairs. The largest known colony had more than 15,000 pairs in 1940 and 1941, with a population density of more than 250 pairs per acre in parts of the woodland. No other colonies have been found in Texas which even approach it in size.

All of the important colonies known are located in dense woodland near former channels of the Rio Grande. The Texas ebony (*Pithecollobium flexicaule*) is almost invariably present either as a dominant or common species and is a favorite nest tree. Granjeno (*Celtis pallida*) associated with mesquite (*Prosopis glandulosa*) form another favored nesting habitat. The soil types represented are among the best in the delta, consequently most of these woodlands have already been cleared to provide agricultural land. The small acreage of such woodland remaining limits the available first-class nesting grounds. As yet it is not known whether the amazing density of breeding pairs in some of these colonies is an ancestral habit or whether the shrinkage in area of preferred nesting grounds in recent years has concentrated greatly the principal colonies. In northeastern Mexico where the subspecies has also been studied by the Fish and Wildlife Service no such densities of breeding White-winged Doves have been found, except in delta woodland near the Rio Grande.

The principal objectives of the conservation agencies cooperating in this investigation are to learn how a further decrease of White-winged Doves can be prevented, and how, if possible, the population can be increased. The acquisition of the several largest nesting areas, constituting less than 1,000 acres, would be a most timely move to prevent further depletion of the Texas population. Some management of these permanent refuges may be found practicable.

A closed season on White-winged Doves in Texas has been suggested by some conservationists; however, if the primary causes of decrease are directly and indirectly due to continued reduction in area of nesting grounds, a closed season would not solve the problem.

The recommended acquisition of the most important remaining nesting grounds of the Eastern White-winged Dove in Texas involves more than consideration of this one decreasing subspecies. It envisions the preservation of representative areas of delta woodland together with their rapidly disappearing biota. Unless these units are acquired for permanent protection as State or Federal refuges, it seems likely that they, too, will be cleared in the not far distant future.—E. G. Marsh, Jr. and George B. Saunders.

Ohio Fish Hatcheries

During the past decade conservation in America has made rapid and satisfactory progress. At present this progress is partially slowed down because of the war, and in some fields there is an increasing tendency toward destructive exploitation. Some of the temporary exploitation seems necessary; some, however, does not. Oft-times conservation policy can be drastically changed to meet war efforts demand and at the same time actually aid in putting some new or better practice into effect.

In the past, the Ohio Division of Conservation and Natural Resources has raised only one crop of fishes annually in its highly-specialized fish farms. Bass and other game fish have received first consideration, and only secondary consideration has been given such food fishes as the catfishes. Realizing the growing need of fishes as protein food for war needs, the State Conservation Commission recently announced that the fish farms will be used this year to produce two crops instead of one as heretofore. The first crop will be bass and the second food fishes. Instead of using 200 tons of carp to raise four- to eight-inch bass for fall liberation, a much larger number of bass fry will be hatched in the ponds and liberated at three weeks of age. The ponds will be stocked immediately with the adults or fry of food fishes, and these will be fed on middlings and meat scraps, which cannot be used directly for human consumption. In addition to the food fishes produced in the ponds, the 200 tons of carp will be saved for human use, thus adding still more to the nation's food supply.

The plan also keeps the hatcheries phase of fisheries work intact and in readiness for expansion at the end of the war.—M. B. Trautman.

Water Conservation

"There seems to a general idea now that something must be done about water conservation; something more than has ever been done in a state where the land policy has been to drain and develop more fields. There are conservationists who assert that Indiana has got a good start toward producing a dust bowl of its own, and that the water problem is the most serious and most fundamental of all the conservation problems facing the state. It is not merely a question of fish and game; it is becoming a question of alternate flood and drought; a question of good crops or poor; it is a question of food and prosperity." (*Outdoor Indiana,* 9 Feb., 1942: 19.)—F.N.H.

Wildlife Conservation Committee,
Frederick N. Hamerstrom, Jr., Chairman

ORNITHOLOGICAL LITERATURE

American Bird Songs. Recorded by the Albert R. Brand Bird Song Foundation, Laboratory of Ornithology, Cornell University. Released by Comstock Publishing Co., Cornell Heights, Ithaca, N.Y. 1942. Six standard, ten-inch, double disks in album. $5.00 postpaid.

Here are the bird song recordings that ornithologists have been waiting for. Their appetites whetted by the two earlier (1934, 1936) offerings of bird song recordings by Albert Brand and his associates, bird students will get real satisfaction from this splendid series of six standard double-faced records of the songs and instrumental music of 72 species of North American birds. The species range from common birds of the East to West Coast species like the Wren-tit and California Thrasher and from the drumming of the Ruffed Grouse to the cacophonic chorus of Texas Chachalacas.

There is, naturally, some variation in the perfection of the recording and a few species are somewhat marred by an obtruding background of mechanical sound caused, perhaps, by too great amplification of the original recording. However, other songs, such as the thrushes, orioles, and the Mockingbird, are remarkably perfect. In any case it will repay the bird student to experiment a little with different phonographs and even different needles and adustments of any single machine. Under the best possible conditions of reproduction these records give an astonishingly good rendition of bird song.

The Albert R. Brand Bird Song Foundation has indeed presented us with a remarkable new means of facilitating bird study. No longer need the student spend years, for example, tracing for himself and attempting to remember and compare the songs of the Veery, the Olive-backed, the Hermit, and the Wood Thrush; now he need merely run the Brand record a few times and compare directly these authentically labeled, excellent renditions of all four species.—J. Van Tyne.

Wisconsin Birds. A Preliminary Check List With Migration Charts. By N. R. Barger, Elton E. Bussewitz, Earl L. Loyster, Sam Robbins, Walter E. Scott. Wisconsin Society of Ornithology. 1942. 32 pp. $.25 of Earl L. Loyster, Care of Wis. Conservation Dept., State Office Building, Madison, Wis.

This very useful publication provides additional evidence of the great increase in active ornithological work now taking place in Wisconsin. The last complete work on Wisconsin birds appeared in 1909 and the need for a new one is great. The present list will temporarily fill that gap and will stimulate and guide much of the work that is necessary before an adequate new book can be prepared.

The arrangement of this list is rather novel. The greater part consists of a series of tables on the even pages which list the names of the 366 forms recognized as occurring in Wisconsin and gives a very brief summary of their status, followed by a chart showing the seasonal distribution of records. On the opposite page one finds the same species listed and space provided for recording the numbers of each found on 10 field trips. The rigidity of this scheme results in the providing of places for future listing of some extinct or extirpated birds but the amount of space thus wasted is not great. From the introduction we learn that 228 forms have been found breeding in Wisconsin but it is not possible to recognize all of them on the tabular list.

There are some small, obvious slips like the listing of "Turkey Vulture, species undetermined," but these are few.

Except for one footnote, scientific names are not given but the authors state that they have followed the A. O. U. Checklist nomenclature.

A modified Life Zone map of the state appears on the back cover but is not referred to in the text. The paper concludes with a properly conservative hypothetical list of 27 forms and a bibliography of about 70 titles.—J. Van Tyne

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Cliff Swallow gathering mud. Muscongus, Maine, July 15, 1942. Photograph by Allan D. Cruickshank.

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A MANAGED CLIFF SWALLOW COLONY IN SOUTHERN WISCONSIN

BY IRVEN O. BUSS

SEVERAL writers have described techniques and methods for songbird management. Most of the management practices are general suggestions applicable to a number of species. I know of no one who has measured the results from managing a species of songbird over a long period of time.

Mr. Cory Bodeman of Deerfield, Wisconsin, has succeeded in increasing a single pair of Cliff Swallows (*Petrochelidon albifrons albifrons*) to a colony of over 4,000 birds in 38 years. Without his help it is doubtful whether or not the first pair of birds, which arrived in 1904, would ever have succeeded in raising any young. It is certain that the present colony would be much smaller if the swallows had not been assisted.

Early History

In early May, 1904, a pair of Cliff Swallows started building their nest on the east side of Mr. Bodeman's unpainted barn. The mud structure was located under a 20-inch eave and fastened to one of the two-inch vertical strips or battens that covered the cracks of the upright "siding." Daily observations showed that the swallows succeeded in hatching their eggs, but English Sparrows (*Passer domesticus*) killed the young at an early age and dragged them from their nest. The parent birds remained about the barn until late July, but did not lay a second clutch of eggs.

As a boy of 16, Mr. Bodeman became very angy with the sparrows and declared war on them immediately. Shot was expensive and not easy to get in 1904, so selected gravel was substituted in his father's muzzle-loading shotgun. It is impossible to estimate the number of sparrows shot during the years of the muzzle-loader, but the weathered boards around the barn are densely pock-marked, attesting to thousands of rounds fired.

The second year (1905) a pair of swallows nested in the same nest built the previous year. It is likely that these were the same birds that first constructed the nest, for they arrived on almost the same date, and occupied the nest immediately upon arrival. Both the resident and

neighboring sparrow populations were now greatly reduced; hence, the swallows had no difficulties in successfully hatching and rearing their young.

The swallows gradually increased until 1911, but that year there appeared to be fewer birds than in any of the preceding three years. Mr. Bodeman believes that drought conditions during 1910 caused a number of the swallows to attempt nesting at neighboring barns where there was more water and mud for nest building. These nestings were total failures, as uncontrolled sparrows killed all of the young swallows at these farms.

After 1911, mud pools were made available for nesting swallows during dry years to prevent the birds from moving to other nesting localities. Despite this help, the population did not increase as rapidly as was expected. In 1926, A. W. Schorger (1931: 7) counted 456 nests on the barn. He says, "All but 38 were located on the east side of the barn. Here there were three and four tiers of nests. . . . Slats have been nailed horizontally to help keep the nests in place."

Later History

One of the most important management techniques necessary for successful Cliff Swallow management was learned by accident. During the spring of about 1928, a heavy rain washed most of the previous year's nests to the ground. New nests were rapidly built following the storm, and a great increase was noted in the size of the fall colony. Since the increase in population appeared to result directly from the construction of new nests, the old nests were knocked down the following spring by the use of a ladder and a long pole. Again nesting success appeared to be higher than in previous years; so thereafter the old nests were annually removed from the barn.

Examination of the removed nests showed that English Sparrows had carried many feathers into them and had occupied them during the absence of the swallows in fall and winter. Some of the nests showed that sparrows had begun to lay eggs in them before the swallows arrived. Many of the nests that contained old debris and feathers also contained dead swallows. Evidently the sparrows were directly responsible for heavy parasitism which caused considerable mortality among both the young and nesting parent swallows. New nests apparently were free of parasites.

This technique was very successful if mild weather prevailed after the first swallows arrived. However, a sudden drop in temperature after the swallows began to arrive one spring, caused insects to remain dormant and hence prevented swallows from feeding. All of the swallows remained flightless during the prolonged cold weather. Many of them perched in their partly-constructed nests waiting for warm weather. Exposure and hunger killed great numbers of the birds, while others

contracted diarrhea and died later. In telling me of the birds that had died, Mr. Bodeman said, "I picked up a milk pail full of the birds and took them to Deerfield so the people could see them." From that year to the present, only part of the old nests were knocked down before the birds arrived in the spring. If a sudden cold wave occurred, the swallows made use of the remaining old nests for protection. After nesting was well under way and the danger of low temperatures was past, all of the old nests were removed.

Figure 1. The use of horizontal strips for nesting. This is one of the most important techniques in Cliff Swallow management.

Before long it became apparent that the rapidly increasing swallow colony needed more room for nesting. In 1937, a two-inch horizontal strip was nailed on the barn 10 inches below the slats seen by Schorger in 1926. This gave the swallows an opportunity to extend their nests below those of the previous year, and gave them a secure foundation on which they could begin construction. A strip was placed on the opposite side of the barn the following year, and immediately the swallows utilized the entire strip for nesting. On July 21, 1940, about

1,200 nests were counted on the barn. On July 11, 1941, 1,970 nests were counted, and on July 14, 1942, 2,015 nests were counted. These counts are not accurate, as the number of nests that had fallen by July could not be determined, but they indicate that the colony is still increasing, for the number of fallen nests likely did not vary greatly during these three years.

Figure 2. East side of Mr. Bodeman's barn showing some of the 1,200 nests counted on July 21, 1940.

Nesting and Feeding

Some of the swallows are paired within a week following the arrival of the first birds. Nest building also begins at this time. Contrary to the belief of some observers, Cliff Swallows do not carry mud for their nests continuously. After enough mud has been brought and put in place to form about an inch of the nest, construction ceases while the mud dries. The length of the interval before construction continues is determined by the rapidity of drying. Cold weather causes a momentary halt in building whether or not the incomplete nest has dried sufficiently to enable additional pellets of mud to be added. I have observed intervals varying from one day to more than a week. As the nest nears completion, the amount of mud added per construction period decreases and the danger of breaking away part of the nest by building activity

increases. Accidents in construction may occur, but the fallen fragments are replaced rapidly. Part of the nest may be broken down during incubation, or after the young have hatched, but repairs are always made immediately.

T. S. Roberts (1932: 51) says, "The Eave Swallow's nest, in its perfect form, is a remarkable structure, but frequently the decurved entrance tunnel is imperfect or absent. The lack of reenforcing material, such as is used by the Barn Swallow, renders it very fragile when thoroughly dry. Both birds assist in the building and in the care of the young. The lining is often placed and the eggs laid before the completion of the nest. The pellets of sticky mud are gathered in the mouth, while the birds hover in the air with wings fully extended above the back." Although the wings are nearly always extended above the back while the swallows gather mud, they do not actually hover in the air. Considerable support is gained by placing their extended feet on the mud during this process. Some swallows were seen resting at the supply of mud, while most of them rested at the nest site. He adds that ". . . nests are partially superimposed upon one another; inside nests [are made] of bits of straw, grass, or feathers." Of the several thousand nests I have observed, all contained small quantities of straw, grass, or leaves, but practically none contained feathers. The nests that contained feathers were heavily lined with them, and obviously were feathered by sparrows. During the peak of nest building activity from five to 40 swallows were seen at one time selecting native grass and sedge materials from a hog house covered with hay cut in a nearby marsh, but no swallows were ever seen selecting materials from the oat and barley straw piles closer to the barn.

Four or five eggs are generally deposited soon after the mud dries, but as Roberts stated, they may be deposited before the nest is completed.

Some of the birds compete strongly for nest sites. In their competition they often fight, become completely engrossed in their struggles, and flutter to the ground where they are easily caught by cats. I do not know whether these are males or females, as the sexes are difficult to distinguish.

In spite of all efforts to shoot the sparrows that come near the barn, some succeed in laying eggs in the swallow nests. When this occurs, the swallow incubates the eggs and feeds the young. If a swallow chances to lay an egg in a sparrow-occupied nest, the sparrow refuses to incubate any of the eggs.

The growth rate of the newly-hatched sparrows is greater than that of the newly-hatched swallows; hence the sparrows soon dominate the young swallows, crowd to the nest opening, get nearly all of the food brought to the nest by the parent swallows, and eventually starve the young swallows. By listening for the characteristic calls of the young

sparrows from the nests, it is easy to locate the ones that contain these parasites. Breaking open the entrance of the nest reveals the emaciated swallows. After the young sparrows are removed, the nest is repaired and the swallows are adequately cared for.

In April, May, and June, the entire colony may leave the barn for two or more hours a day to feed. During these feeding periods the young are especially vulnerable to the onslaughts of sparrows. On one occasion Mr. Bodeman attended a circus in Madison and found that "sparrows had killed hundreds of young swallows" while he was gone. The young were pecked on the head, and in most cases dragged from their nests.

When insects were abundant close to the barn during the period of juvenile development, the adult birds did not go out together as a single group. In this case there was mutual association of the birds at all times, for there appeared to be a continuous flight of departing and incoming birds between the barn and the source of the insect food. The most conspicuous example of such feeding occurred while an alfalfa field was being mowed near the barn. A large group of birds constantly hovered over and behind the mower and caught the moths (*Noctuidae*) that were disturbed to flight by the sickle. Each bird seemed to be trying to get the maximum number of moths it could carry before departing for its nest. Frequently birds were seen dropping moths as they attempted to get additional ones in their mouths.

Post-nesting Period

Several writers have stated that Cliff Swallows commonly raise two broods of young in a season. During July, while the early-hatched young are spending most of their time on the barn roof, a few swallows may be observed incubating eggs. It seems more likely that these incubating birds are not raising a second brood but are re-nesting birds whose first nests fell from the barn.

Soon after the early-hatched young have reached mature size, they leave their nesting site with their parents. The size of the group varies according to the number of birds that began nesting early. From the time the first group leaves until the late-hatched young have grown to adult size, several groups may leave the nesting site. Each group apparently remains intact after leaving the nesting site but may congregate with Barn Swallows, Rough-winged Swallows, Tree Swallows, or Bank Swallows. These heterogeneous groups seek the open fields and ponds where food is abundant and go through a conditioning period preparatory to fall migration.

The nature and direction of Cliff Swallow dispersion from nesting sites is not understood. I believe that more Cliff Swallows disperse to the north of their nesting localities than in any other direction. The appearance of large groups of Cliff Swallows north of known nesting sites, following the nesting period, suggests this movement. Elton

Bussewitz informs me that nearly all Cliff Swallows recorded in the vicinity of Watertown (17 miles northeast of Mr. Bodeman's farm) were seen during July and August. During this same period I have been unable to secure swallow records for the region south of Mr. Bodeman's farm. Other records substantiate this observation. H. H. T. Jackson (1923: 486) saw "about 300 Cliff Swallows roosting on the telephone wires at Bent's Camp," Mamie Lake, Wisconsin, from August 22 to 28, 1917. He does not give earlier-season records for a large-sized group. All the Cliff Swallows I have seen during late July and August, in the latitude of southern Wisconsin were flying northward. It is possible that all Cliff Swallows in this region start northward and later, when they have finished their conditioning period, migrate southward over a more eastern or western route. Evidence for this northern movement is not conclusive, and banding studies will be necessary to verify or disprove it.

Management

The success of Cliff Swallow management depends largely upon the success of sparrow control. Its importance is pointed out by William Brewster (1906: 300) who says "the Eave Swallow suffers directly and very seriously from the encroachments of the House Sparrows who destroy its eggs and young and take possession of its nests whenever opportunity offers." T. S. Roberts (1932: 50), W. B. Barrows (1912: 544), E. H. Forbush (1929: 145), Joseph Grinnell (1937: 207), and Dayton Stoner (1939: 221) are among the numerous writers who have recorded similar depredations by the sparrow. Mr. Bodeman has found it advisable to shoot sparrows every month in the year. When the swallows arrive in the spring, less shooting is necessary to keep the sparrows under control. From April, 1941, to April, 1942, Mr. Bodeman shot 1,075 rounds of 22-caliber shot cartridges at sparrows. Estimating two birds for every three shots fired gives a kill of 717 sparrows. This estimate is probably low, for I have seen him shoot six consecutive sparrows without a miss.

Although mud may be carried for nest building as far as three-fourths of a mile, it should be made available close to the nesting site. Long-distance carrying often results in some of the swallows nesting in undesirable locations near the mud supply. Such nestings cause a reduced population due to the loss of all young and part of the adults. Mud pools should be made in the open where they are easily found by swallows and not easily approached by cats. Loam, silt loam, and clay loam (rather than sandy or gravelly soils) make the best mud for nest-building.

Once Mr. Bodeman fastened old Cliff Swallow nests to his machine shed and thus induced swallows to nest there. The machine shed never had nests on it prior to his experiment. He had done it only as an experiment and did not want the swallows to continue there, so at the end of the season he knocked down all of the nests and the swallows

made no effort to rebuild on the shed in subsequent seasons.

When colonies increase and nests are extended more than four feet below the eaves, more eaves or shelves should be added, as heavy rains may wash away nests that are not protected by the eaves.

The oil in paint does not allow mud to adhere to painted surfaces. If it becomes necessary to paint the barn occupied by nesting swallows, a strip should be left unpainted beneath the eaves on which the birds can fasten their nests. If painting the entire barn is necessary, an unpainted board or two may be nailed beneather the eaves for the swallows. Rough lumber is much better for nesting than planed lumber.

Chronology

April 13 to 25:	First Cliff Swallows arrive at Deerfield, Wisconsin. (Fly directly to nesting site).
April 30:	Last birds reach nesting location. (Some of the earliest arrivals are now paired).
May 1 to 15:	Early arrivals building nests. (Most birds have little or none of their nests constructed).
May 15 to 31:	Peak of nest-building activity.
June 10:	Most nests completed. (About five per cent still carrying mud).
June 1 to 10:	First eggs hatch.
June 10 to 20:	Period of most frequent hatching.
July 10:	Last eggs hatch.
July 20 to August 15:	Last birds leave nesting location.
July 20 to September 1:	Most birds preparing for migration. (Do not return to nesting location).
Sept. 1 to 15:	Most birds migrating southward.
Oct. 4:	Last birds leave Deerfield, Wisconsin.

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Birds Across the Sky. By Florence Page Jaques. Illustrations by Francis Lee Jaques. Harper & Brothers, N.Y. 1942: 5½ x 8 in., xiv + 240 pp., 25 pls. $2.50.

From the firm of Florence Page and Francis Lee Jaques, we have learned to expect art and artistry, charm and humor. In this, their latest effort, there is all of that. Ornithologists will find amusement in seeing how funny they sometimes appear to a layman, even a sympathetic one. Laymen will find enthusiasm and a very non-technical explanation of some of the strange antics of the trained "bird-man." No more understanding readers can be found than ornithologists' wives who, trained in other fields, have had ornithology and ornithologists thrust upon them with matrimony. They will confirm Mrs. Jaques' pictures of the patient efforts of the birdmen to educate which, nevertheless, leave the learner feeling well-nigh imbecilic and exasperated beyond measure. They will give joyful assent to her assertions that a richer and more absorbing life comes with a fuller acquaintance with the bird world. They will heartily endorse her descriptions of bird addicts as "some of the finest, most delightful and inspiring people."

Mrs. Jaques writes with facility, with a light philosophical touch, and with a sensitiveness not only to word sounds and meanings, but also to colors and situations. She differs from the bird census takers, perhaps also the taxonomists, by her acceptance of the bird as an individual, not as belonging to species or subspecies, tagged with absurdly long polysyllabic names. Her effort to describe sound and color effects is challenging, though it will convey varying meanings to different readers, as in "the gold-dark song" of the hermit thrush, or the "stainless sky."

Mr. Jaques has added greatly to the charm of the book with many delightful black and white drawings. Some are significant for their humor, others for sense of graceful movement, others for accurate characterization. His love of trees and his knowldge of them are beautifully exemplified in "Grey Fallodon" and "Deep Forest." As usual, Mr. Jaques' duck pictures are of especial interest.

Lovers of England and the English will find the chapter describing an English spring and the meeting with Lord Grey sharply disturbing when read in these harrowing times. Those who have read "Canoe Country" and "The Geese Fly High" will probably find Mrs. Jaques' sidelights on the American Museum of Natural History, and especially the description of her husband's method of planning the lovely exhibits, her joy in the dance of the woodcock, and the elation which the migration of the Blue and Snow Geese brought to her, of particular interest. "Birds Across The Sky" is not as even as the two preceding books, partly because it describes such various episodes and partly because it is handicapped by a "purpose to instruct." It lacks the lyrical quality of "Canoe Country" and the pure joyousness of "The Geese Fly High." In spite of these slight criticisms this book will bring gratification because of its many merits and because of the varied interests, the quick and sensitive feeling, and the joyful nature and warm sympathy of the author.—Helen Van Tyne.

INTERCOVEY SOCIAL RELATIONSHIPS IN THE VALLEY QUAIL

BY WALTER E. HOWARD AND JOHN T. EMLEN, JR.[1]

SOCIAL barriers between members of different coveys of Valley Quail (*Lophortyx californica vallicola*) have been observed and studied under natural conditions at Davis, California since 1936 (Emlen, 1939). In these studies it was noted that birds which wandered beyond the limits of their own covey range were strongly attracted to other groups of quail which they happened to encounter. Wanderers that attempted to mingle with a strange covey on its home range, however, were quickly singled out and driven off by the residents at each approach. Thus, in a mixed covey, alien birds were almost invariably found a few yards from the main body of natives.

Because of the possible significance of intercovey social barriers to problems of quail dispersion and distribution and to the general question of social organization in bird populations, it seemed desirable to obtain further information on intercovey relationships by experimentation. Accordingly a series of experiments was performed at Davis, California during the winter of 1939–40.

We wish to express our appreciation to Mrs. M. M. Nice, Dr. P. L. Errington and Dr. T. I. Storer for valuable criticisms and suggestions in preparing this paper.

Experimental

Experiments were conducted on three covey ranges (B, C, and D of Figure 1) where conditions for observation were particularly favorable. Additional birds for some experiments were obtained from three other ranges (A, E and F) in the neighborhood. Range B, although it had been occupied by a covey during the four preceding winters and was apparently in excellent condition, was vacant in 1939–40. This provided a site for two introduction experiments (Nos. 9 and 10).

All quail on the observation areas were labeled with showy field markers visible at a considerable distance; dyed chicken feathers "imped" (spliced by means of a corroded needle [Wright, 1939]) to clipped rectrices and a similarly colored celluloid band on the left leg designated covey membership; two celluloid bands of various color combinations on the right leg identified individuals within a covey.

The experiments were of three types: (1) those in which birds, singly or in groups, were transported from their native range to that of another covey; (2) those in which birds, singly or in groups, were temporarily withdrawn from their native range to be returned after varying periods of time, and (3) those in which birds from two sources

[1] Contribution from the Division of Zoology, University of California, Davis, Calif.

were introduced together into an unoccupied range. Observations on experimental coveys were made almost daily in the early morning and

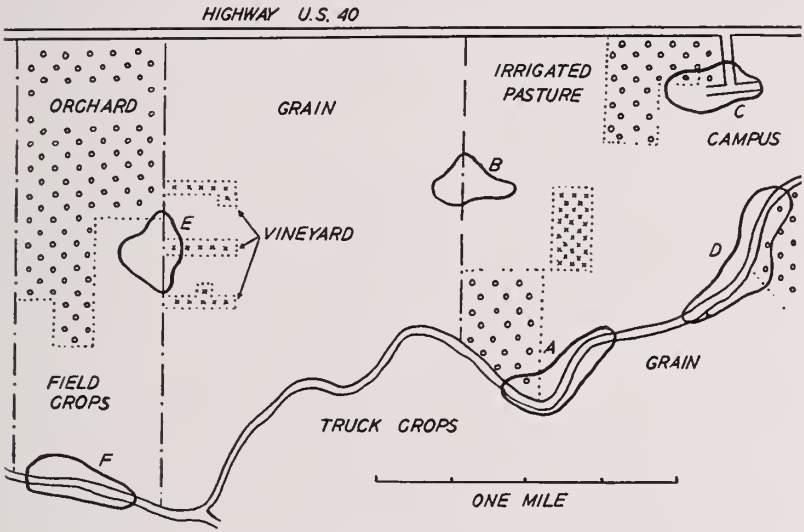

Figure 1. Covey ranges of Valley Quail.

late afternoon when activity was greatest. Ten experiments involving 29 experimental birds were completed before the breeding season (Table 1).

Results

Observations may be summarized under the following headings:

1. *Homing behavior was poorly developed in the quail under observation.* Of twenty-six birds transported from ½ to 2 miles from their native covey ranges, only two (Experiments 4 and 5) found their way back during the experimental period. These two homing records, furthermore, may have resulted from random movements rather than from a "homing sense," for in both cases the local distribution of cover favored movements in the direction of the original range. The low incidence of homing behavior of either a directed or a random type may be due largely to the strong and persistent attraction that an established covey exerts on a stray bird or group of birds (see next paragraph). The movement of the male in Experiment 4 may have been facilitated by a reduction in the flock bond, for this bird was already mated (see Experiment 3).

2. *Birds on a strange range were attracted to any group of quail they encountered.* During the winter season each quail covey at Davis

TABLE 1

OUTLINE OF EXPERIMENTS ON INTERCOVEY SOCIAL RELATIONSHIPS

Experiment	Bird	Experimental Procedure					Subsequent Behavior (Numbers in italics refer to days after start of experiment)
		Experimental treatment	From Territory	From Date	To Territory	To Date	
1a	♂	None (Natural movement)	A	1–9	D	1–10?	*6* to *16*, attacked frequently by native ♂♂, remains 5 to 10 ft.+ from covey (*9*, threatens a native ♀ attacking ♀ of expt. 1b); (*15*–, frequently attacks ♂ of expt. 2); *17* to *25*, attacked less frequently, approaches closer; *26* to *34*, not attacked by natives, still remains slightly apart from covey; *35*–, completely assimilated.
1b	♀	None (Natural movement)	A	1–9	D	1–10?	*6* to *16*, attacked by native ♀♀ and by ♀ of expt. 1c, remains 5 to 10 ft.+ from covey with ♂ of expt. 1a; *17* to *25*, attacked less frequently, approaches closer; *26* to *34*, not attacked, nearly assimilated; *35*–, completely assimilated.
1c	♀	None (Natural movement)	A	1–5±	D	1–6?	*10* to *20*, attacked by native ♀♀, dominates ♀ of expt. 1b, remains 5 to 10 ft.+ from covey, generally near ♂ and ♀ of expts. 1a and 1b; *21* to *28*, rarely attacked, nearly assimilated; *29*–, no further records (killed?)
2*	♂	Artificial transplant	C	1–23	D	1–23	*1* to *8*, attacked by native ♂♂ and ♂ of expt. 1a, remains 5 to 10 ft.+ from covey, roosts alone; *9* to *30*, attacked less frequently, approaches closer, roosts with covey (*26*, attacks ♂ of expt. 6a); *31* to *35*, not attacked, nearly assimilated; *35*, artificially removed for expt. 3.
3*	♂	Artificial transplant	D	2–26	C	3–1	*1* to *3*, attacked by native ♂♂, remains at considerable distance from covey; *3* to *14*, (paired) remains at considerable distance from covey with mate; *15* to *33*, associates quite freely with pairs of covey; *35*, artificially removed for expt. 4.
4*	♂	Artificial transplant	C	4–4	D	4–5	*1* to *3*, remains at distance from covey, calls much, dominates ♂ of expt. 6a as in earlier period of residence (expt. 2); *6*, has returned to territory C.
5	♂	Artificial transplant	D	2–7	C	2–7	*1*, runs to covey immediately on release, attacked by native ♂♂ after few seconds delay, retires and remains 20 ft.+ from covey; *3*, has returned to territory D.
6a	♂	Artificial transplant	E	2–17	D	2–17	*1*, attacked by native ♂♂ and by ♂ of expt. 2, retires, leaves territory; *33*, reappears, attacked by native ♂♂ (subsequent behavior confused by mating activity).
6b	♀	Artificial transplant	E	2–17	D	2–17	*1* to *15*±, attacked by native ♀♀, remains 5 to 10 ft.+ from covey; *16*± to *42*, not attacked but still incompletely assimilated; *44*, completely assimilated.
7	♂	Temporary withdrawal	D	1–23	D	1–24	*1*, released 50 ft. from covey, merged with them after 30 minutes, completely assimilated.
8a	♂	Temporary withdrawal	D	2–1	D	2–8	*1*, released 75 ft. from covey, merged with covey in 8 minutes and completely assimilated.
8b	♀	Temporary withdrawal	D	2–1	D	2–8	*1*, same behavior and reception as ♂ of expt. 8a.
9a	5♂♂ 6♀♀	Artificial introduction	F	2–15 & 16	B	2–16	Accept and remain on new (vacant) territory into nesting season.
9b	♂		E	2–15	B	2–16	*1*, (released with 11 birds of expt. 9a), not attacked but tended to remain apart from covey, roosts alone; *2*, not attacked but generally apart from covey; *5*, alone on territory; *7*, accepted by ♂♂ of expt. 10a, occasionally attacked by ♂♂ of expt. 9a, remains apart.
10a	3♂♂	Artificial transplant	E	2–21	B	2–22	*1*–, occasionally attacked by ♂♂ of expt. 9a, generally apart and scattered.
10b	2♀♀		D	2–21	B	2–22	*1*–, occasionally attacked by ♀♀ of expt. 9a, but generally accepted, tend to remain apart and scattered.

* Experiments 2, 3 and 4 all involved the same male bird. No other birds were used in more than one experiment.

acted as a focus of attraction for all quail entering its range. Birds appearing on a strange range (through natural wandering or experimental transplantation) approached and persistently followed the native covey for as much as a month or more, often in the face of active opposition (see next paragraph). Groups of 3 to 14 aliens were less strongly attracted to native coveys than were single individuals (Experiment 10; also Emlen, 1939: 120).

3. *Strange birds, alone or in small groups, were quickly recognized as aliens and forcibly excluded from intimate association in an established covey.* Members of established quail coveys at Davis were intolerant of strange birds appearing in their midst. Aliens, introduced or wandering onto an established covey range, invariably found their approach to the covey challenged by the natives. Aliens were never seen to resist these attacks and usually fled at the slightest display of animosity by a native.

4. *The active exclusion of aliens by members of an established covey gradually diminished and eventually disappeared.* Attacks on aliens were, in general, most frequent and vicious on the first day or two of association. Thereafter the intolerant attitude gradually diminished, falling off particularly after about two weeks. By the end of the fourth or fifth week attacks on aliens were rare, although one male in the spring of 1937 was still actively repulsed after the fifth week (Emlen, 1939).

5. *Quail from separate sources did not merge completely until they had "become acquainted."* Alien quail (single individuals or small groups) tended to remain somewhat apart from natives in their roosting and occasionally their feeding activities for several weeks after hostilities had subsided. This may represent a gradual trailing off of the initial native-alien antagonism, or it may be quite independent of it and indicate a hesitancy in these quail to mingle intimately with strangers until an "acquaintanceship" has become established. The latter interpretation is supported by observations in Experiments 9b and 10 in which two groups, established side by side on a range strange to both, demonstrated aloofness from each other with very little of the active antagonism of a native-alien relationship.

6. *Recognition of individuals as covey members was not affected by absences of a week, but was influenced by an absence of 38 days.* Birds withheld from their home coveys for periods of one day and 7 days in Experiments 7, 8a and 8b were immediately assimilated upon being returned. The male in Experiment 3, however, upon being returned to his native covey range after an absence of 38 days was treated as an alien. His acceptance into the covey was apparently more rapid than is usual with aliens, but this reaction may have been complicated by pairing behavior. After being returned to the range

of his second residence where he had become nearly assimilated in Experiment 2, this same bird was again treated as an alien, showing a considerable loss of recognition after an absence of 39 days (Experiment 4).

7. *Alien quail in a covey actively dominated birds of subsequent introductions.* When a succession of introductions was made into a single covey (Expts. 1b, 2, 6a, 6b) alien groups of longest standing attacked later arrivals much as they themselves were attacked by natives. This belligerent attitude toward newly introduced birds often seemed more vicious in partially assimilated aliens than in the established natives. The effect of this behavior was to establish an order of active dominance among the partially assimilated groups in a covey based on seniority of residence on the range. This order was modified in Experiments 4 and 10a where previous social relationship was apparently "remembered" and carried over.

8. *Aliens in a covey were attacked only by members of their own sex.* This feature of behavior, overlooked in the 1937–38 season, was checked almost daily on experimental birds in the present study. Only one instance of attack upon a bird of the opposite sex was noted, and this incident was of very brief duration. Observations did not start until mid-January, only a little over a month before traces of pairing behavior were detected, and it is possible that a low level of sexual activity was already present. Intra-covey fighting is rarely observed in midwinter at Davis, but when it has occurred (7 records in the past 4 years) it has always been between members of the same sex. In one instance (Dec. 4, 1937) a crippled female was repeatedly attacked by female covey mates but was not bothered by the males. These observations suggest that members of this sexually dimorphic species may be capable of sex recognition at all seasons of the year.

Discussion

Because of the difficulties involved in marking and observing under field conditions, very little is known concerning the inter-flock relationships of free-living wild birds. The phenomenon of a closed flock with domination of strangers, however, has been observed in wild Jackdaws, Rooks (Lorenz, 1931) and Chickadees (Odum, 1941: 118; Wallace, 1941: 53) as well as in the Valley Quail herein described. Similar behavior, furthermore, has been noted in flocks of a wide variety of captive animals. An initial attitude of intolerance towards newcomers by an established flock is well known to breeders of Valley Quail, Bobwhite Quail, Pheasants and other game birds; it has also been noticed in captive Song Sparrows (Nice, 1939: 260), White-crowned Sparrows, Spotted Towhees (Tompkins, 1933: 100) and various aviary species (E. C. Kinsey, personal communication). Domestic fowl, especially cocks, persecute new-comers, and precautions are often needed to pre-

vent the killing of an introduced stranger. A comparable initial domination of strangers occurs in herds of sheep, hogs, cattle, horses and various other herbivorous and carnivorous mammals (Alverdes, 1935: 195); it is also reported in wild Howling Monkeys (Carpenter, 1934: 100–104), and is characteristic of many human societies, both primitive and modern. Among invertebrates, ants (Wheeler, 1910: 182) and bees (Root, 1940: 52) are notably intolerant of strangers. A careless attempt to merge two bee hives by placing one upon the other without a separator may result in a conflict and "quarts" of dead bees (J. E. Eckert, personal communication).

When an encounter between strangers takes place on the home range of one of the contending parties, residents often hold an initial advantage over tresspassers (Nice, 1941: 469). In the Valley Quail studied at Davis, natives were invariably successful in their skirmishes with aliens. Differences in age, weight or physical condition definitely were not involved. It seemed rather that a quail on strange territory, and in the presence of strange birds, developed an attitude of subordinance which was quickly detected and capitalized upon by the natives. Three possible explanations for this behavior suggest themselves.

1. *Majority dominance.*—In all the observed instances of intercovey contact, the native group was larger than the alien group. It is thus conceivable that the assumption of dominance by natives was purely a matter of numbers. If this were the case, a large group of quail introduced into the range of a small covey would dominate the latter through sheer "weight of numbers." Unfortunately this critical experiment has not yet been performed. Two incidents, however, provide pertinent information. On November 15, 1936, an alien group of 14 birds wandered onto the range of a neighboring covey which contained 23 birds. Although these invaders did not constitute a majority of the combined covey, they represented a sizeable unit, which conceivably could have disputed for dominance in a majority-ruled order. No such dispute occurred; the aliens all assumed an attitude of subordinance and retired to themselves (Emlen, 1939). Experiment 9 (Table 1) of the present study was designed to test the "majority rule" theory by placing unequal numbers of birds from two covey sources together on an unoccupied covey range. In this synthetic covey the single male from source E, although refraining from intimate association with the 11 birds from source F, was seldom chased and did not exhibit the avoiding reaction characteristic of aliens on unfamiliar territory. The subsequent introduction of 3 more birds from source E in Experiment 10 made no appreciable change in this picture of loose association without definite group dominance.

These two observations do not eliminate majority dominance from the picture; they suggest, however, that territorial associations were more important than numerical inequalities in determining dominance rela-

tionships between natives and aliens in these mixed quail coveys.

2. *Territorial dominance.*—In species showing territorial behavior, aliens are attacked and driven out as a part of territory defense, the territory owner showing nearly complete local dominance over trespassers (Howard, 1920: 97; Tinbergen, 1939: 57; Lack, 1939: 177; Nice, 1941: 469, 470). Territory in the sense of a "defended area" (Noble, 1939: 267), however, does not help to explain the native-alien relationship in Valley Quail. With the exception of some unmated males during the nesting season, quail at Davis have never been observed to exhibit anything that resembles proprietory behavior toward a piece of land. Aliens are not molested on a covey range until they approach the covey itself. The chase which follows such an approach is typically short and directed merely away from the body of the covey, not across any territory boundary.

3. *Seniority of residence dominance.*—In observations at Davis the natives of a covey (the group in longest residence on the area) always acted as the dominant group. Where two or more successive introductions were made into an area, the order of dominance followed the order of introduction except as previous associations of the birds modified it. Where unequal groups from two independent sources were liberated together on an unoccupied range, inter-group dominance was essentially absent. This suggests that seniority of residence on a range may be a decisive factor in determining the dominance of natives over aliens.

The favorable psychological effect of "being locally established" has been demonstrated in various territorial species and in laboratory animals. Schjelderup-Ebbe (1935: 967) observed it and described it in detail for the domestic fowl. Whitman (1919) and Shoemaker (1939) detected it in doves and canaries, respectively. Noble, Wurm and Schmidt (1938: 23) showed that in non-breeding pigeons, a low-ranking bird after becoming established in a small cage by itself assumes a local dominance over superior pigeons subsequently introduced into the cage with it. Diebschlag (1941) found that when a flock of pigeons was moved about from cage to cage the dominant role shifted from one individual to another according to the cage occupied. Such locality-linked dominance has often been interpreted as a form of territorialism. Diebschlag, however, found that each male pigeon in a cage defended nothing beyond its resting place and that the area surrounding this small inviolate territory often served as a sort of buffer ground on which other birds were tolerated but dominated. Confidence gained through familiarity with the area seemed to be fundamental to the degree of dominance achieved.

In free-living Valley Quail, although the site of an encounter definitely influences the outcome, there is no evidence that territory, *per se,* provides the incentive for aggressive behavior. The dominating attitude

of established residents over aliens may better be attributed to confidence gained through familiarity with the topographical and vegetational features of the covey range. A bird suddenly released into unfamiliar surroundings is conceivably placed at a psychological disadvantage. In a peck-right society any such handicap would affect the social reactions and hence the position of a bird in the social order. Covey range may well be an adjunct to social aggressiveness without being an objective. This would seem to be the case in the quail population under study.

Summary

A series of experiments designed to test the social relationships between members of different coveys of Valley Quail at Davis, California confirm earlier observations that social barriers of non-recognition and active exclusion discourage inter-covey mixing. It was further noted in the experimental coveys that strangers were attacked only by birds of their own sex (observations between January and April), that active exclusion gradually subsided with continuous association, that unacquainted birds did not mingle freely even in the absence of active exclusion, and that partially established members of a covey dominated aliens of subsequent introductions. It is suggested that the dominance of aliens by established residents is in large degree related to a favorable psychological attitude gained through familiarity with the physical features of the covey range. Aliens acquire the "confidence" fundamental to social recognition only after a period of residence on the range.

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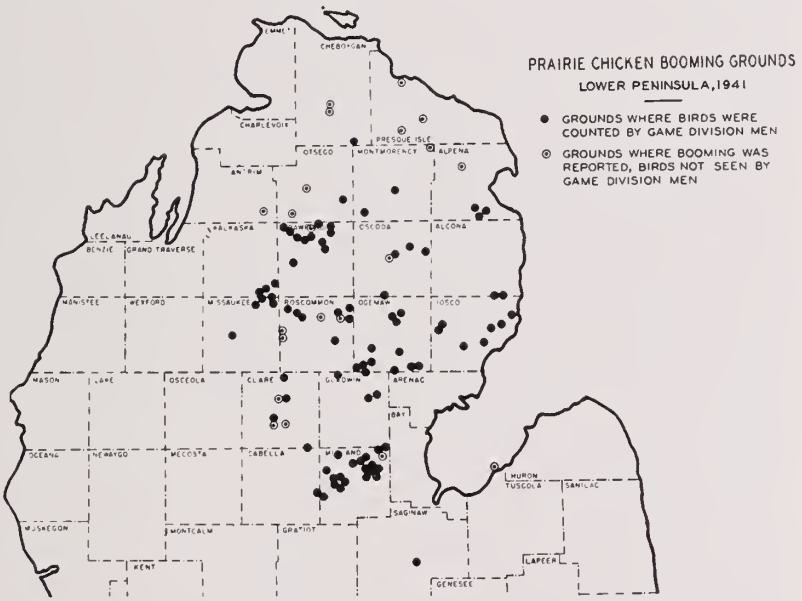
A PRAIRIE CHICKEN BOOMING GROUNDS SURVEY IN CENTRAL MICHIGAN

BY DONALD W. DOUGLASS

THE Greater Prairie Chicken (*Tympanuchus cupido americanus*), an important game species in northern Michigan, attracts scientific and popular attention because of its picturesque and colorful courtship display. This display, commonly known as "booming," from the sound produced at the climax of the performance, is useful to field men attempting to determine numbers of birds on an area, since it renders the birds conspicuous and easy to approach.

When male Prairie Chickens are actively booming, the investigator may drive through suitable country stopping every half mile or so to listen for the sound, which under extremely favorable conditions has been heard four miles away. Direction of the sound from successive listening posts, together with varying intensity, guides the observer to the booming ground. In northern Michigan, at least, the grounds can



frequently be reached by car, since suitable clearings are usually associated with roads or trails. In effect, the car serves as a movable blind to which the cocks, intent on their display, are largely indifferent. From the car an accurate count can often be made of the birds on the site.

Actively displaying birds are males; some males, however, may be

quiet, and therefore indistinguishable for the time from females. Since inactive birds are easily overlooked, total counts should be made by flushing the chickens from the booming grounds. When a booming ground must be approached on foot from a distance, less accurate counts are to be expected, as the birds often flush before the investigator obtains a good view of them.

In 1938, field men of the Game Division, Michigan Department of Conservation, made a survey of Prairie Chicken booming grounds in the northern part of the state. In no sense complete, it nevertheless promised well for the method. A similar survey was carried on in 1940, and a much more complete effort was made, with increased personnel, in 1941. Distribution of the booming grounds found in the Lower Peninsula by this latter survey is shown on the accompanying map. I believe that the map represents the main breeding range of the species in the Lower Peninsula. The western limits, however, are not yet clearly defined as the strip from western Isabella County to Grand Traverse County and northeastward to Emmet County needs more detailed study. Certain "holes" in the map represent areas that merit more attention.

These "holes" were to have been filled in in 1942, but travel curtailments restricted the work to a partial check of the 1941 observations. Since the 1941 data are the most complete available, they may be summarized briefly:

Birds were counted by Game Division men on 85 booming grounds; 21 additional sites shown on the map were reported by other observers or were approximately located by the sound of booming, but were not actually visited. A total of 472 males, 57 females was reported from the 85 grounds, but sexes were not always distinguished accurately. Totals represent maximum counts, since 40 booming grounds were visited more than once. While five was the most commonly reported number of cocks present on a single site, two of the grounds had only one present and nine only two. These single birds were observed only once each and possibly were not on established grounds; all but three of the instances of two birds on a site represented two or more observations. The maximum number of males on a booming ground was 31.

Of the 85 sites visited, 32 were on a knoll or hill, the remaining 53 on level ground, of which 11 were low and wet. Seventy-one of the grounds were within a mile or less of cultivated fields, 53 within ¼ mile, and 25 on cultivated land. The sites were generally open, mostly covered with sparse grass or other herbs; only 24 of the grounds showed woody growth other than sweet fern. Such woody growth consisted chiefly of scattered shrubs or small trees typical of the surrounding country.

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THE WILD TURKEY IN EARLY WISCONSIN

BY A. W. SCHORGER

IT is patently incongruous that a strictly American bird should receive the name Turkey, so a brief explanation of the appellation seems desirable. During the Middle Ages most of the strange and exotic forms of plants and animals came to Turkey from India by caravan and were then shipped to the various European nations. The bird or plant was then called after the country in which it supposedly originated. Our native maize became Turkish wheat. This is by no means an obsolete custom. The Hungarian Partridge (*Perdix perdix*) is not peculiar to Hungary, yet since the birds introduced originally into America came from that country it will be called Hungarian, probably, until the end of time. The Spanish brought to Europe the Mexican race of the Turkey and it is from this stock that our domestic fowl descended. Nevertheless, it was destined to be known as the Turkey or Indian Bird. The Spanish call the Turkey *gallo de India* (Indian cock) or *pavo*, while in France it is known as *coq d'Inde* (Indian cock) or *dindon*.

These preliminary remarks have a direct bearing on the subject, for in attempting to determine the early status of the Eastern Turkey (*Meleagris gallopavo silvestris*) in Wisconsin, the nomenclature is found to be somewhat confusing. Father Hennepin [1] was on the Upper Mississippi in 1680 and his statement that Turkeys occurred at Lake Pepin has been quoted frequently. In his book of travels the terminology becomes decidedly mixed. He mentions that while near Lake Pepin his party killed seven or eight large Turkeys (*coqs d'Inde*). This might be an acceptable statement had he not mentioned, a few pages beyond, that the Indians were very desirous of obtaining guns, having seen three or four Bustards or Wild Turkeys (*Outardes ou Coqs d'Inde*) killed at a single discharge. Here the *Outarde* or *Bustard* becomes synonymous with Turkey. In other parts of his book, it is perfectly clear that both *Coq d'Inde* and *Outarde* do not refer to the Turkey. Lahontan,[2] who came to Canada in 1683, mentions that he hunted the *Outarde* or *Bustard* on Lake Champlain and used decoys set in the water for this purpose. No amount of wishful thinking could place a Turkey in this situation. The bird that he was hunting was unquestionably the Canada Goose, for *Outarde* is the name by which this species is known in Quebec to this day. Michaux [3] shot a Canada Goose at the mouth of the Cumberland River on September 16, 1795, and states that both the French of Illinois and Canada call it Bustard (*Outarde*). Jonathan Carver [4] (1766) added to his personal observations by pilfering from Hennepin and mentions likewise the occurrence of Turkeys at Lake Pepin. In the absence of further authority, we are forced to the conclusion that Hennepin's Turkeys were Canada Geese.

Usually there is a logical basis for the use of these seemingly peculiar names. I spent considerable time on their possible derivation. The early explorers naturally would call the new American animals by the names of the creatures in Europe that they resembled most closely. The *Outarde* or Bustard is a large stocky bird. The spreading of the tail and other phases of courtship demeanor give it a decided resemblance to the Turkey. Only speculation can be offered for the synonomy of *Outarde* and Canada Goose. It was mentioned above that one of the French names for the Turkey is *Dindon*. The latter when used figuratively, as in paying a compliment to a human being, means a goose. Further investigation of the popular nomenclature by which the Turkey, Canada Goose, and Bustard may be one and the same bird will be left to a person more skilled than I in genetics.

It would seem that the French had muddled the nomenclature sufficiently without additional assistance; yet during the last century there is found a distinctly American contribution. The Sandhill Crane became known as Turkey or Northern Turkey in the region of the Upper Mississippi Valley. The name is heard seldom today except in the prairie provinces of Canada. John Lewis Peyton [5] was in northern Wisconsin in September, 1848, and mentioned seeing "some wild turkeys" while crossing a plain between LaPointe and the St. Croix River. A hunter in St. Croix County, in 1889, returned home bearing proudly a Wild Turkey that he had killed. Considerable persuasion was necessary to convince him that the bird was a "crane".[6]

Another obvious error is to be found in the reports [7] of a Wild Turkey having been killed when in reality, or in all probability, it was a domestic bird that had wandered into the timber. As an example, the following letter written at Osceola, Polk County, by an irate farmer under date April 7, 1868, will be quoted in part:

"Mr. Editor:

. . . They may be wild turkies, but if so, they must have run wild the day before he killed them, for at that time they were my *tame* turkies . . .

[Signed] Frederick Greenwold."

In this paper the range of the Turkey will be traced from the northeastern section of the state to the southwestern. Elizabeth Sellentin [8] came to Green Bay in 1837 and stated that the bird served on Christmas day was the Wild Turkey, "the most beautiful of American birds," and not the domestic one. This statement is not entirely satisfactory since a Turkey could be transported from a considerable distance to the southward during a Wisconsin winter. Fortunately there is corroborating evidence from the approximate latitude of Green Bay. Mrs. Mary Bristol [9] came to Green Bay in 1824 and during her six years of residence attended a wedding at Grand Kaukaulin (Kaukauna).

There were served for supper "all kinds of wild meat . . . turkey, quail . . . and porcupine with the quills on." The problem in this case was to fix the date of the event. It was found that the wedding was that of Margaret Grignon and that it took place in June, 1829. It is unlikely that at this season game could have been transported any great distance without spoilage. Incidentally, the Menominee Indians have lived in the Green Bay region ever since their first contact with the whites, and they had a Turkey clan.[10]

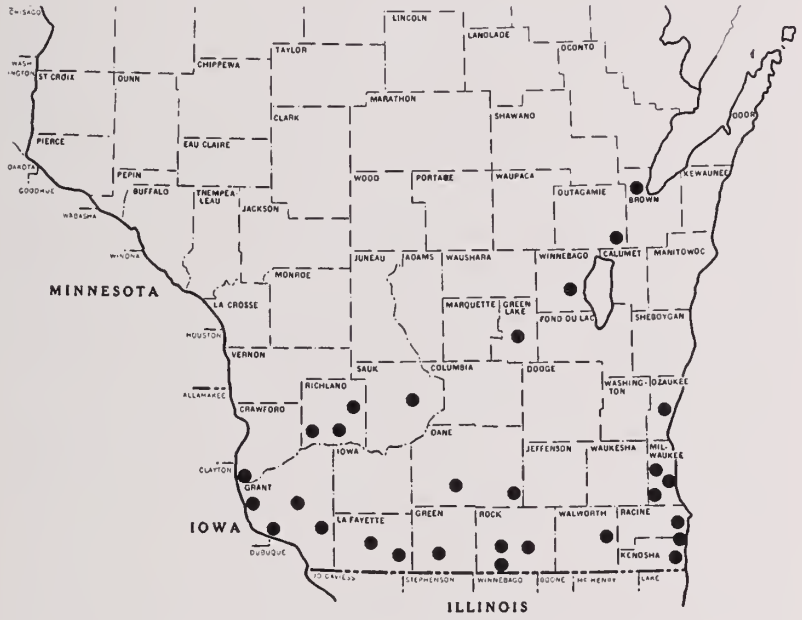

Figure 1. Range of the Wild Turkey in Wisconsin.

One of the earliest and best records for the occurrence of the Turkey in the vicinity of Lake Winnebago is due to the Jesuit, Allouez.[11] In April, 1670, he visited the Fox Indians who then resided at Lake Winneconne on the Wolf River. He wrote: "There we saw two Turkeys perched on a tree, male and female, resembling perfectly those of France —the same size, the same color, and the same cry." This statement is too circumstantial not to be accepted at full value. He uses the name *coqs d'Inde,* and the fact that they were sitting in a tree eliminates the Canada Goose and other aliases.

Richard Dart [12] arrived at Green Lake, Green Lake County, in 1840 and he states: "There were likewise wild turkeys and plenty of geese." In spite of the early establishment of Fort Winnebago at Portage there

is no definite statement of the occurrence of the Turkey. Mrs. John H. Kinzie [13] who came to reside at the fort in 1831, mentions that the Indians used "feathers of the wild turkey" as ornaments in the hair. These feathers might have been obtained by trade or brought from a distance. For example, St. Pierre [14] wrote from his fort at Mount Trempealeau that on May 6, 1736, a party of Sioux warriors was travelling down the Mississippi for the ostensible purpose of hunting Turkeys to secure feathers for their arrows. This letter is further indication also that these birds did not occur at Lake Pepin or even as far north as Trempealeau County.

The surveyor, William H. Canfield,[15] came to Sauk County in 1842 and was attached to the government survey of 1842–43. He had a keen interest in natural history and, in his list of the birds of the county, states that the Wild Turkey occurred formerly. The adjacent county of Richland had large numbers of Turkeys. Judge James H. Miner [16] mentions that when the towns of Willow and Richwood were first settled deer and Turkeys were exceedingly plentiful and furnished the principal meat supply of the early settlers. Mr. Aldo Leopold [17] was informed by George Johnson, district game warden at Richland Center, that he had discussed frequently the early status of game in the county with the Winnebago Indian, Good Bear. Good Bear stated that he had killed Turkeys along the Pine River, presumably while a young man. He died at Kilbourn in 1930 at the reputed age of 103 years.

The notable traveler, H. R. Schoolcraft,[18] was at Prairie du Chien, Crawford County, in 1820, and recorded the Turkey as common along this part of the Mississippi. An army officer [19] stationed at Prairie du Chien wrote on August 23, 1847: "Turkeys and deer are plenty in the woods."

An extension westward of the northern boundary of Crawford County would coincide nearly with the boundary line between Iowa and Minnesota. The latter represents the northern limit of the range of the Turkey west of the Mississippi until the Missouri River is reached.

The Turkey was abundant at times along Lake Michigan at least as far north as Port Washington. Just why the species ranged so much farther north, to Green Bay, in the eastern part of the state than in the Mississippi Valley is difficult to explain. The beech tree has a rather narrow range in eastern Wisconsin but occurs entirely around Lake Michigan. It is possible that beech nuts, of which Turkeys are very fond, combined with a succession of mild winters may have tolled the birds farther north here than elsewhere.

The first mention of Turkeys along Lake Michigan is due to Father Marquette.[20] On November 23, 1674, his canoe was beached at the Milwaukee River. He wrote: "Pierre shot a deer, 3 bustards (*outardes*) and three turkeys (*coqs d'Inde*)." There is no confusion here. Pierre killed three geese and three Turkeys. In October, 1679, Hennepin,[21]

who was with LaSalle's party, mentions that their men "killed some very fat Turkey hens" * in the region between Racine and Kenosha.

Andrew Vieau [22] came to Port Washington, Ozaukee County, in the spring of 1838. At that time his only neighbors comprised a single family at Saukville. He mentions that during the following winter he took by ox-team loads of "turkeys, venison, and other game" to Milwaukee for sale, in which enterprise he was very successful.

Wild Turkeys and other game were so abundant in the market in the "village" of Milwaukee in January, 1839, as not to be considered a luxury.[23] A. W. Kellogg,[24] came to Milwaukee in January, 1837, and mentions the killing of three birds out of a flock of Turkeys found on the farm at Kellogg's Corners. The species is mentioned as plentiful in 1839 when Martha E. Fitch [25] arrived in the village. The last Wild Turkey killed at Milwaukee is stated to have been shot by Dr. E. B. Wolcott in the First Ward in the winter of 1839.[26] It is doubtful if this was the last Turkey killed in the vicinity for in December, 1842, there appears the enthusiastic statement: "There are more Turkies, Venison, and other wild game to be found in Wisconsin than in any Territory in the Union."

During the winter of 1827–28, John H. Fonda [27] made a trip from Green Bay to Fort Dearborn (Chicago). He found Indians starving in their village on Lake Michigan, in Kenosha County, "though the country was teeming with deer, wild turkies and elk." Wild Turkeys were mentioned in 1844 as occurring near Racine but they were "by no means abundant." [28] Dr. P. R. Hoy [29] states that they were once very plentiful. The last occurrence for Racine was in November 1846, when a small flock that appeared was hunted with such energy that all the birds were killed. In 1853 he considered them as still abundant in the southwestern counties. A. C. Barry,[30] of Racine, did not mention the Turkey in his list of birds published in 1854. It had become so rare that an inhabitant of Racine, on receiving an Illinois Wild Turkey in December, 1859, mentions that it was the first that he had ever seen.[31]

Walworth County once had Wild Turkeys in considerable numbers. Charles M. Baker [32] is authority for the statement that in October, 1836, a flock of fourteen was seen in the town of Spring Prairie. A year or two later some birds were killed from a flock of about thirty that wintered in the town.

Turkeys existed at Lake Koshkonong as late as 1842, according to Thure Kumlien who settled there in 1843.[33] The only resident I know who had seen a native Wild Turkey, was H. L. Skavlem † of Janesville.

*The reading is: "Nos gens tuoient de leur côté des poules d'Inde fort grasses & enfin le dixhuitiéme du mois. . . ." The second London issue of 1698 reads differently: ". . . our Men [killed] a great many Turkey-Cocks very fat and big, wherewith we provided ourselves for several Days. . . ."

† H. L. Skavlem was born in the town of Newark, Rock County, October 3, 1846 and died at Janesville, Wisconsin, January 5, 1939. He resided in the town of Newark until 1880.

He wrote to me on January 29, 1929, that he had the distinct memory of seeing Philip Goss carrying a large Wild Turkey that he had shot, and showing it to his father. This is probably the bird killed in the town of Newark in 1854 and mentioned by him as the last record for Rock County.[34] It may not have been the last county record. His son, L. N. Skavlem,[17] informs me that his mother was born in the town of Plymouth, Rock County, March 30, 1851. She remembered, when a child, that a man stopped at their home with two Wild Turkeys tied by the legs and thrown over his shoulder.

The town of Verona, Dane County, was settled in 1837. Bears and Wild Turkeys "were very plenty for a few years after the first settlers came."[35] In 1934 and 1935 I interviewed several of the old residents of Green County. Mr. Sylvester Belveal, aged 84 at the time, stated that his mother came to Green County in 1834. The farm was in the "Richland timber." One spring during the maple sugar season she assisted in the capture of a large Wild Turkey. Mr. Willis Ludlow, of Monroe, informed me that his father, A. Ludlow, began his business career by buying merchandise in Chicago and transporting it by wagon to Fort Winnebago (Portage) for sale to the soldiers. He camped by the way and told of seeing Wild Turkeys between the present sites of Monroe and Portage. Turkeys were at one time very common in Stephenson County, Illinois, that borders Green County. John H. Thurston[36] tells that Charley Pratt killed seventeen young Turkeys one day in early fall within two miles of Freeport.

Charles Rodolph[37] located at Fort Hamilton, now Wiota, Lafayette County, in 1834. At that time there was an abundance of "deer, . . . wild turkeys, grouse . . ." W. R. Smith,[38] who was in the lead mining region in 1837, did not see any Turkeys but was told that they were numerous in many parts of the territory.

The highest density of Turkey population occurred undoubtedly in southwestern Wisconsin in the county of Grant. James Lockwood,[39] who came to Prairie du Chien in 1816, said: "It was not an uncommon thing to see a Fox Indian arrive at Prairie du Chien with a hand sled, loaded with twenty or thirty wild turkies for sale, as they were very plenty about Cassville, and occasionally there were some killed opposite Prairie du Chien." At that time the Fox Indians had a large village, called *Penah* (Turkey), on the present site of Cassville. In 1828, Fredrick G. Hollman[40] settled at Platteville. Bear, deer, and wild Turkeys "were to be found in astonishing quantities." Daniel R. Burt[41] mentions the killing of a fine Turkey along the Grant River, near Burton, in December, 1835. At that time flocks numbering from ten to forty birds were to be seen by going a short distance into the timber. As late as 1856, Wild Turkeys sold for as little as twenty-five cents apiece in the streets of Lancaster.[42]

The Turkey was almost extinct in Wisconsin by 1860. Dr. Hoy[43]

mentions that one was shot in Grant County in the fall of 1872. The last record of possible acceptance is the statement that one flew over the village of Darlington, Lafayette County, in May, 1881.[44] It is probable that this bird came from Jo Daviess County, Illinois, just to the southward. Statements [45] that the Turkey was to be found commonly in Wisconsin at this time are erroneous.

The scarcity of records for the last half of the past century is due to several causes. A large portion of southern Wisconsin was originally prairie, but it would be an error to assume that the Turkey did not use this type of terrain. During summer and early fall it wandered freely into the prairies and oak openings, but during the remainder of the year stayed rather closely to timber. Abel,[46] writing of Wisconsin and Iowa, in 1838, says that on the prairies "you will find thousands of prairie fowls, wild turkeys, . . .". Thurston [36] came to Rockford, Winnebago County, Illinois, in 1837. This county was largely prairie and he mentions that Turkeys were plentiful in the timber along the Pecatonica River, elsewhere being seldom seen. A more important factor affecting our information was the severe winter of 1842–43 when the species was nearly exterminated. It was about this time that the agricultural development of Wisconsin was well under way and soon there were very few Turkeys remaining for incoming settlers to see. It is for this reason also that there is little value in mentioning the negative evidence I obtained during the past decade from many pioneers.

The near extinction of the Wild Turkey is stated succinctly by Dr. Hoy: [43] "I am told, by Dr. E. B. Wolcott, that turkeys were abundant in Wisconsin previous to the hard winter of 1842–43, when snow was yet two feet deep in March, with a firm crust, so that the turkeys could not get to the ground; they hence became so poor and weak that they could not fly and so were an easy prey for the wolves, wildcats, foxes and minks. The Doctor further stated that he saw but one single turkey the next winter, and none since." The above winter was known in Wisconsin for decades as the "hard winter."

I will advance at this point a supposition termed the *reservoir* theory. It is axiomatic that a species is most vulnerable on the border of its range. If this were not the case, the border would not exist. Over a long period of years the numerical status of a species is subject to ebb and flow due to weather, food supply, disease, or other causes. Extensive study of early ecological conditions in Wisconsin leads to the conviction that at least three of our native species of birds, the Pinnated Grouse, the Quail, and the Wild Turkey, maintained a foothold in Wisconsin only by virtue of periodic replenishment from Illinois.

The Wild Turkey is a perfect example for the theory. It has been shown above that this species at times ranged as far north in Wisconsin as Green Bay. This extension would be rendered possible by a succession of mild winters. There must have been numerous occasions when

the Turkey was extirpated, or nearly so, due to the severity of the winter. It was mentioned above that Marquette landed at the mouth of the Milwaukee River on November 23, 1674. Though so early in the season, it was cold and over a foot of snow covered the ground. He went on to the present site of Chicago to spend a winter marked by intense cold and deep snow. He wrote in his diary on December 12: "We contented ourselves with killing three or four turkeys, out of many that came around our cabin because they were almost dying of hunger." All animals were affected by the extreme weather and, by the latter part of February, the deer were so lean as to be unfit for food. Since this condition prevailed at Chicago, it is probable that most of the Turkeys in Wisconsin perished during that season.

Direct evidence in support of the theory has been found. In December, 1852, a party of Milwaukee hunters went to Rock Prairie, Rock County. In the course of their hunt they killed seven Wild Turkeys, the largest of which weighed 14 pounds and 9 ounces. The point of most interest is the statement that Wild Turkeys "in droves" had entered Wisconsin due to the noise and hubbub of railway construction in northern Illinois.[47] That this was the cause for the immigation is open to grave doubt. The important thing is that the Turkeys came. Had primitive conditions prevailed, it is seen easily how Wisconsin would have been restocked.

The recent attempts [48] to reintroduce the Wild Turkey are not new. In 1887, two pairs of Wild Turkeys from the Indian Territory were brought to Lake Koshkonong by Mr. Gordon and released in the woods to breed under natural conditions.[49] In 1890 the estimates of their number varied from 23 of pure stock to more than 200 of pure and mixed stock.[50] Hunters secured "Wild Turkeys" in the vicinity up to 1892. In April of this year a bird weighing eighteen pounds was killed by August Lalk.[51] The difficulty was that the Turkeys wandered away in small flocks and never returned. Aside from lack of suitable environment, disease, and the tendency for the Wild Turkey to become semi-domestic, it is doubtful if a planting will ever become successful in Wisconsin. Biologists have learned that every species requires a certain minimum population to overcome natural hazards and maintain existence. In the case of the Wild Turkey, there are no longer reserves to the southward.

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The Pigeon. By Wendell Mitchell Levi. Printed at Columbia, S. C., 1941: 8 x 11 in., xxxii + 512 pp. (profusely illustrated). With preface by Dr. Oscar Riddle. Published by the author at Sumter, S. C. $10.00.

Persons interested in wild birds from the standpoint of field study or merely love of the outdoors are apt to have little use for wild birds in captivity or for those which have been domesticated. A bird is a bird, however, no matter where it is or how much it may have been altered by generations of breeding under man's care and direction. For this reason, serious students of bird biology will recognize that the way birds react under any conditions may contribute enlightenment on their behavior, variation, physiology, and characters in the wild.

The ordinary book on domesticated birds deals almost entirely with empirical details of care and management and pays little attention to the underlying principles involved. Levi's book, "The Pigeon," however, is not an ordinary book. It does not deal so much with details of the breeds and their "standards" as have numerous works in the past, but no previous book on pigeons has treated so comprehensively the scientific aspects of the genetics, physiology, and behavior. In these fields the coverage is surprisingly thorough, and the bibliographic references will prove of the greatest value to anyone desirous of pursuing the subjects further. The discussion of such subjects as the sex ratio, mortality, homing, and the like should prove especially pertinent to students of bird ecology.

Other parts of the book will be of more interest to pigeon raisers and fanciers, but they also contain much of more general interest. Such chapters are, of course, those which deal with the differentiation and breeds, the anatomy, care and feeding, and diseases and their control. In short, this is a book which any bird student would do well to have at hand for reference.—Leon J. Cole.

GROWTH AND DEVELOPMENT OF ENGLISH SPARROWS *

RICHARD LEE WEAVER

THIS study was made on the campus of Cornell University during the summer of 1937. Due to the heavy concentration of English or House Sparrows (*Passer domesticus*) around the Agricultural buildings, augmented by the presence of 75 nesting boxes, a great amount of material was available for study. The nest sites were visited each day during the nesting season and the young were measured, weighed and examined at approximately the same hour. Most of the work was done between the hours of four and six in the afternoon. More than 2,500 measurements were taken on young birds during the course of the study.

Description of Newly Hatched Young

Contrary to Dwight's (1900:171) statement, English Sparrows have no natal down. They are entirely naked when hatched, as was later pointed out by Boulton (1927).

The feather tracts of the dorsal surface are discernible as blue lines under the skin but the skin is unbroken anywhere by feathers. The eyes are closed and the ears appear to be so. The body has a pinkish-flesh color except for the white edges of the bill and the white toe-nails. The organs of the abdomen show clearly through the skin, and the lungs appear somewhat lighter in color in the region of the thorax. The head and the dorsal surface of the wings appear just a trifle darker than the rest of the body.

Although the margins of the bill are almost pure white, the center is horn- or straw-colored, capped by a similarly colored egg tooth. The interior of the mouth is bright red.

Changes in the Young from the Second to the Fourth Day

Little change occurs in the second and third days, except that the feather tracts are much darker, and the points of the primaries have become evident on the posterior borders of the wings. By the fourth day the skin over the eyes has broken. The interior of the mouth is duller in color. The edges of the bill are now lemon yellow. All of the feather tracts are traceable. A continuous dark band extends from the nares over the head and down the middle of the back to the tail, outlining the capital and spinal tracts. The primaries project through the skin one to two millimeters. There is no evidence of the yolk mass. The ears are more evident now as small round holes. The general appearance of the bird is dark gray due to the developing feathers under the skin.

* Submitted in partial fulfillment of the requirement for a minor thesis for a Doctorate at Cornell University September, 1938 and presented in part at the annual meeting of the Wilson Ornithological Club at Indianapolis, December 27, 1937.

Fifth, Sixth, and Seventh Days

The eyes are open by the fifth day. By the sixth day the young are half as heavy as when they leave the nest. Many of the contour feathers are through the skin on the sixth day. Marked changes occur in the appearance of the young birds by the seventh day after hatching. Feathers are breaking through the skin in parts of all of the feather tracts. Many of them, especially in the ventral tract, lose their sheaths immediately. The bird appears generally slate gray. The narrowing apteria appear flesh-colored. In the alar tract, the secondary coverts, and other

Figure 1. English Sparrows 6½ to 7 days old.

small feathers on the anterior and proximal portions of the wing are coming through the skin and unsheathing as they appear. These feathers are tipped with brown. The alula is 3 millimeters in length.

The primaries average 6.6 millimeters in length and have unsheathed one millimeter. The primary coverts are about 4 millimeters long and largely unsheathed. Three rows of feathers in the humeral tract have broken through the skin on the dorsal side of the tract and are unsheathed. On the anterior portion of the capital tract just above the bill the feathers are through the skin .5 millimeter, while only breaking the skin in other parts of the tract. The feathers in the cervical region of the spinal tract have projected through the skin 1.5 millimeters and are slightly shorter in other parts of the tract.

All of the feathers in the ventral tract have broken through the skin and are unsheathing as they appear. The rectrices are 5.3 millimeters long and are unsheathed only at the tips. The undertail coverts measure 1.5 millimeters and are white. All of the feathers in the femoral tract have broken through the skin, but few in the crural tract have appeared although they are very dark. The eye and ear openings each measure 3 millimeters.

Eighth and Ninth Days

The most noticeable change during these two days is the acquisition of color in the various tracts as the feathers continue to become un-

Figure 2. English Sparrow ten days old.

sheathed. The lesser coverts are tan and form a slight wing bar. The head is becoming brown, although remaining dark gray about the base of the culmen. The back is brown but the neck remains dark gray, almost black. The rectrices have brown tips, the upper tail coverts are light brown, the lower tail coverts white. The alula and primaries appear slate gray. The humeral tract is rich brown in color, while the upper feathers in the femoral tract are tan and the lower ones white. The feathers on the front side of the leg in the crural tract are white while those on the back are tan. The ventral tract is light gray to white.

Tenth to Fifteenth Day

Most birds which are handled daily for nine days will leave the

nest prematurely. Measurements were made on a limited number of banded birds retrieved after they had left the nest.

In these five days the feathers rapidly cover the apteria, giving the young birds a more adult appearance. The coverts on the wings and tail lose their sheaths more rapidly, accentuated to some extent by the use of the bill. The basal sheaths of the flight feathers are retained for some time after the young depart from the nest. A few sheaths are visible in parts of the spinal tract when the bird leaves the nest but none are evident in the ventral tract, except possibly in the cervical region.

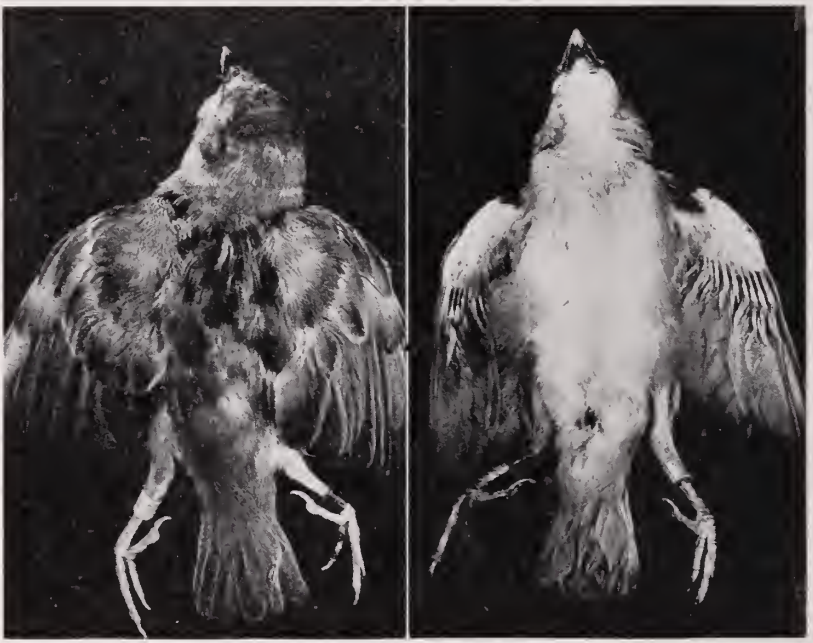

Figure 3. English Sparrow 14 days old.

The primaries grow from 20 millimeters on the tenth day to 44.6 millimeters on the fifteenth day and the sheaths on these feathers are reduced from four-fifths to one-fourth the total length. The rectrices advance from 11 to 30.7 millimeters in the same period and have become unsheathed from 3.6 to 21.7 millimeters.

The bill has a horn-colored tip, now surrounded by a black ring half way back. The soft portion of the bill has been reduced to about one-third of the horny central portion. The toe-nails are much darker than when hatched. The interior of the mouth has become pinkish-yellow. Young males will show signs of a black bib. In other respects the young birds look much like adult females.

Sixteenth to Eighteenth Day

Only a few birds were available for observation in this period as most of those observed earlier had left the nests. The most noticeable change is in the rapid rate of growth of the flight feathers. The primaries advance from 43 to 52 millimeters and the rectrices from 30.7 to 40 millimeters. The primary and tail coverts have reached maturity. The birds are very active and can fly rather well.

Comparison with Other Species

The development of the feather tracts, the pattern and centers of development, and the appearance of the individual feathers in the English Sparrow, follow very closely that found by Boulton (1927) for the House Wren, another hole-nesting species. However, when compared with the Tree Sparrow, studied by Baumgartner (1938), the Chipping Sparrow which I studied (1937), and the Song Sparrow studied by Nice (1937), there is a marked difference, which is expressed particularly by the early development of the contour feathers in these non-hole-nesting species. These birds progress more rapidly in their earlier stages, but the English Sparrow feathers out very rapidly in the later stages. Since it remains in the nest four to five days longer it is also more fully feathered when it leaves the nest, than are these other species.

Fledging Period

The time required for fledging varied from 12 to 16 days in 23 nests which were not used for measuring the young. In the nests where the young were handled daily the young left sooner than that. The average fledging period was 14.4 days in the 23 more or less undisturbed nests. The young left the nest at 12 days in five nests, at 13 days in seven nests, at 14 days in four nests, at 15 days in six nests, and at 16 days in one nest.

Witherby et al. (1938) give the fledging period in England as 15 days, but the Heinroths (1924) and Niethammer (1937) say that the young birds normally remain in the nest for 17 days in Germany.

Average Rate of Growth

Many birds of known ages were measured on each day of the fledging period. The average for all measurements and the number of birds used daily, are shown in Table 1. Although some are shown in fractions on the chart, it indicates merely the result of averaging the measurements of a number of birds. Weight increased about two grams per day for the first thirteen days, starting at 2.8 grams and reaching 25.6 grams, the greatest weight attained before leaving the nest.

Behavior of Adults During the Fledging Period

From the time the young birds hatch until they leave the nest both

TABLE 1

AVERAGE RATE OF GROWTH OF ENGLISH SPARROWS

Day	Number of measurements	Total length	Wing	Gape	Primaries	Primary coverts	Rectrices	Weight
1	53	40.0	6.1	7.5				2.8
2	39	48.6	7	9				4.8
3	33	56.1	9.2	10				6.9
4	30	63.8	12.5	11.8	pt.			10.2
5	23	67.6	16.5	12.2	1.4(pt.)*	.6 (0)	1.9(pt.)	11.7
6	31	73.0	17.9	12.8	3.3(pt.)	1.7 (0)	2.7 (1.0)	13.8
7	21	82.5	22.7	13.2	6.6 (1.0)	4 (0)	5.3 (1.5)	16.4
8	25	84.6	27.3	13.8	11.7 (2.0)	7 (1.4)	8 (2.0)	18.0
9	19	91.0	32.7	13.8	18.8 (4.3)	9.8 (1.8)	11 (2.0)	20.3
10	20	91.0	34.1	14	20.1 (4.5)	10.8 (3.0)	11 (3.6)	20.4
11	19	103.0	41.4	14.4	27.7(11.0)	15.2 (7.4)	17.8 (6.6)	22.7
12	10	107.2	45.8	14.4	29.9(16.7)	17.1(11.8)	21.2(10.2)	22.7
13	15	115.0	49	14.7	36 (25.0)	18 (13.6)	25 (15.0)	25.6
14	6	117.0	50	14.8	37.5(25.5)	18.1(14.8)	27.4(16.5)	25.2
15	4	123.0	57	14.8	43.6(32.1)	18.8(15.0)	30.7(21.7)	23.9
16	1	112.0	42	14.5	40 (25.0)	22 (14.0)	25 (22.0)	26.0
17	2	126.0	60	15	49 (43.0)	18 (18.0)	33 (31.5)	22.5
18	1	126.0	64	16	52 (45.0)	18 (18.0)	40 (30.0)	

Measurements are in millimeters and grams.

* "Pt." is used to indicate a mere point of feather—too small to measure readily. The second figures, in parentheses, indicate the amount of the same feather that had broken out of the sheath.

parents share equally the duty of feeding them. However, other duties are not shared equally. The female takes care of the nest sanitation and keeps the young warm at night. If there is overcrowding in the nest, the excrement may not be removed. Although I did not find any males spending any time in the nest box, Daanje (1941) in Holland reports that the male does share equally with the female in the brooding of the young. During the first five days after hatching the young are fed by regurgitation, but are not fed in this manner during the latter part of the period in the nest, as was pointed out earlier by Niethammer (1937) and Witherby et al. (1938).

SURVIVAL

From 180 eggs laid in 38 nests, 127 young were raised successfully, which is 70.5 per cent success. This corresponds very closely with that found for other hole-nesting species and is contrasted with 43 per cent success for species nesting in the open (Nice 1937: 142–144). In none of the 38 nests did six young survive, but in 7 five survived, in 12 four survived, in 11 three survived, in one nest two survived, and in two nests none survived.

Young Leaving the Nest

As the young develop and the time for them to leave the nest approaches, the larger ones are found to be the highest in the nest, with their heads sticking out the entrance. Thus, they have a distinct advantage during the latter part of the fledging period as all of the feeding is done from the outside of the nest cavity.

One young was observed to leave the nest under fairly normal circumstances. It was sitting in the entrance, while both of the adults were away. A door slammed nearby and the young flew out, landing on a shed roof close to the nest. It attempted to fly up the side of the barn when a person approached, but failed and stopped on a window sill, half way down the side. When the female returned, she found it there and coaxed it to a lower level and thence over the shed out of sight. The female and young were not seen again that day and the male continued to feed the young in the nest alone.

In several cases the young flew from the nest when I approached. The older ones commanding the highest position in the nest were always the first to leave. Two days often elapsed before the others were ready for their initial flight.

The young are able to fly rather well upon leaving the nest. One young bird was seen to leave a nest box about eight feet from the ground and to fly sixty yards, landing in the top of a tall elm tree. It was almost impossible to catch any young sparrows which left the nest around fifteen days after hatching. The longer period in the nests permits the English Sparrows to acquire more strength and better developed feathers than such birds as Robins, Chipping Sparrows, or Tree Sparrows.

Young Birds Out of the Nest

In the instance in which the young bird was observed to leave the nest because of the door slamming, the female soon found it and then remained with it, while the male cared for the rest of the family. At other times when the young left, both the male and female were observed feeding the same young. However, the more common procedure was for the female to care for several of the young and the male to care for the others. This seemed to be determined mostly by the manner of scattering as the young tried to follow the adults to secure food.

Contrary to Daanje's (1941) statement that the female takes most of the care of the fledged young (for the male may be more interested in starting the next brood than in the older young), I observed a fairly equal distribution of care during the period directly after the young left the nest. In one case the female withdrew within one week, starting a new nest while the banded male continued to feed the young for at least two weeks more.

Niethammer (1937) also observed this attention by the male, and

says that the young "are fed for a while after learning to fly, evidently especially by the male, then collect in flocks, which the older birds join later. At this time true mass gatherings often take place, accompanied by a great deal of noise, in densely foliaged tree tops, also in the middle of large cities."

The Heinroths (1924) observed that "the young have a strong bond to one another after leaving the nest, in contrast to thrushes, nightingales, and some other birds that prefer to be alone."

The adults feed the young for at least two weeks and may do so for a longer period. Since the English Sparrow raises two broods each year and the second brood may not be started for a month or more after the first was started, juveniles can be found in all stages of development during the latter part of the summer.

A complete post-juvenal molt begins four to six weeks after the birds take to the wing, the Heinroths (1924) setting it at five weeks. The general molting for all young took place at Ithaca during the early part of August and continued through mid-September, requiring four to five weeks to complete the molt.

Summary

English Sparrows are hatched without natal down.

The interior of the mouth of newly hatched young is bright red, but becomes pinkish-yellow before the young leave the nest.

The egg tooth disappears and the edges of the bill change from white to lemon-yellow by the fourth day after hatching.

The first appearance of the feathers and the sequence of their development in the various tracts and regions follows a very definite order which resembles very closely that found by Boulton in House Wrens and Weaver in Chipping Sparrows.

The greatest development in the plumage of young sparrows is delayed until the latter part of the period in the nest. The greatest change in appearance of young English Sparrows occurs between the age of six and seven days, when most of the feathers emerge and many of them lose their sheaths.

By the tenth day after hatching the color pattern is evident, showing a wing bar, and in some males a black bib.

Practically all of the sheaths have disappeared from the contour feathers and all but one-fourth of the flight feathers are unsheathed by the fifteenth day. These sheaths may remain one to two weeks after the young depart from the nest. The greatest amount of sheath is present in the flight feathers on the eleventh day. The amount of sheathing present gives an accurate criterion of the age of young birds in the nest.

Most of the young left the nest at about the fifteenth day, but English Sparrows may remain in the nest for seventeen days if entirely undisturbed.

Males and females share about equally in the feeding of the young at the nest, but the females do the greater portion of the nest sanitation. Both birds may brood the young, although the female does the greater part of it and always stays in the nest during the night. The young are fed by regurgitation during the first part of the period after hatching.

There was 70.5 per cent success of survival in thirty-eight nests which produced 127 young from 180 eggs laid. This corresponds closely to that reported for other hole-nesting species.

The older young are able to command the most advantageous positions in the nest and thus receive relatively more food and often are able to leave the nest several days before the other young. The young can fly rather well upon leaving the nest, considerably better than do the young of most species that nest in the open.

The young are fed by the adults for a period of two weeks, and probably more, after leaving the nest. The young have a strong bond for one another. The young, out of the nest, may be fed entirely by one adult or by both.

A complete post-juvenal molt begins about five weeks after the young leave the nest. It began in early August and ended in mid-September at Ithaca in 1937.

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FACTORS INFLUENCING LOCAL MOVEMENTS OF WOODLAND BIRDS IN WINTER *

BY VERNA R. JOHNSTON

DURING the winter of 1939–40 and 1940–41, I studied the local movements of birds in a forested area along the Sangamon River near Cerro Gordo, Illinois, 40 miles southwest of Champaign.

A map of the area was drawn and copies of it were mimeographed to be taken into the field. The map was drawn roughly to scale and contained various small landmarks by which a bird's location at any

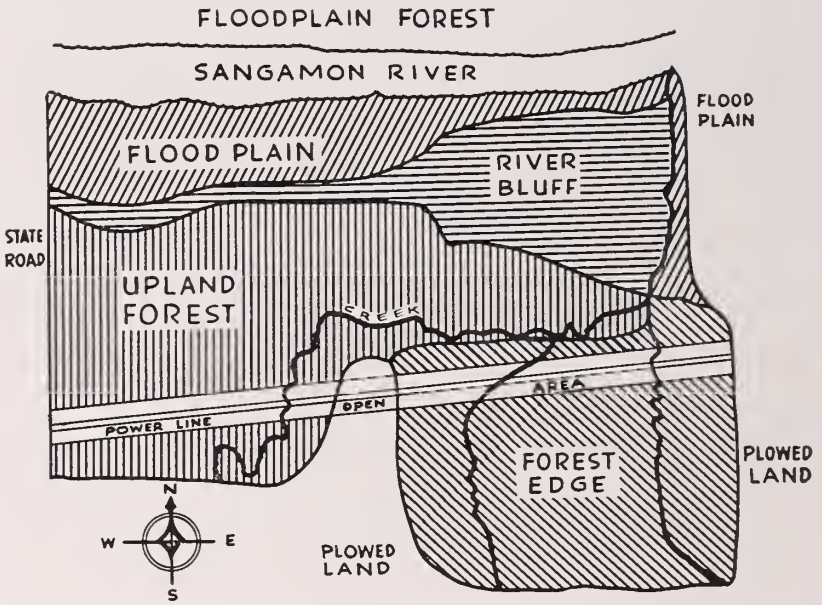

Figure 1. Map of the area studied.

place in the area could be determined. On each trip the distribution of the birds in the area was carefully marked on a copy of the map, and notes were taken of the birds' behavior, flocking, songs, and other points. Trips to the area were made one to two times per week during the winter months.

* Contribution from the Zoological Laboratory of the University of Illinois. Grateful acknowledgment is made to Dr. S. Charles Kendeigh for his suggestions and guidance.

I watched particularly the effects of wind, temperature, sun, and precipitation on the distribution of the birds, and on the tendencies of certain species to flock together.

Description of the Area

The area is a second-growth forest, typical of those used by farmers for timber and grazing over much of Illinois. It is composed of 46 acres of four chief habitat types (Figure 1): (1) a floodplain along the Sangamon River (2) a heavily-wooded bluff above the floodplain (3) an upland open forest and (4) a forest-edge. An electric powerline runs diagonally through the upland forest and forest-edge area, leaving an open space of twenty yards width in which the trees have been cut and in which common mullein (*Verbascum thapsus*), coralberry (*Symphoricarpos orbiculatus*), thistle (*Cirsium* sp.), and other sun-loving plants grow. The river bluff, 50 feet high, acts as a windbreak, furnishing protection on its south side from north winds and, likewise, shelter on the low north-exposed floodplain from south winds. The bluff slopes steeply to the floodplain on the north but very gradually to the creek bottom on the south. In the forest-edge area elevation is low along the creeks and higher between them. A brief description of the chief vegetation found in each of the four habitats is here included.

Floodplain:

The dominant trees in the low, wet floodplain are silver maple (*Acer saccharinum*), American elm (*Ulmus americana*), and sycamore (*Platanus occidentalis*). Poison ivy (*Rhus Toxicodendron*) is very abundant, and elderberry (*Sambucus canadensis*), wood nettle (*Laportea canadensis*), and giant ragweed (*Ambrosia trifida*) form dense stands during the summer. This area is ungrazed and is flooded each spring. It is but one part of a floodplain extending down both sides of the Sangamon River.

River Bluff:

The river bluff is fairly moist and is characterized by tall red oak (*Quercus borealis*), sugar maple (*Acer saccharum*), and ironwood (*Ostrya virginiana*), with slippery elm (*Ulmus fulva*) and hackberry (*Celtis occidentalis*) also quite abundant. This is the most heavily-wooded habitat, ungrazed, and the region in which spring flowers are most common. A strong north wind strikes the bluff ridge with tremendous force.

Upland Forest:

The upland forest covers a larger portion of the total area than any other one habitat, is open and dry, is grazed freely, and consists almost entirely of mature white oaks (*Quercus alba*) and shagbark hickories (*Carya ovata*), most of them over forty feet high. Coralberry is profusely scattered over this open forest, forming the chief undergrowth.

Forest-edge:

The forest-edge is a block of the type of vegetation usually found growing as a strip along the edge of a forest. The dominant plants here are hawthorn (*Crataegus* sp.) and hazelnut (*Corylus americana*), with black raspberry (*Rubus occidentalis*), gooseberry (*Ribes gracile*), and osage orange (*Toxylon pomiferum*) well represented. This region contains few trees over thirty feet high, and includes the only dense shrub undergrowth found in the entire area. The forest-edge is surrounded on three sides by plowed fields and is connected with the open forest and floodplain on the fourth side. It is grazed and inhabited by numerous cottontail rabbits.

Winter Population

The winter bird population varied but slightly in composition during the two years, consisting of ten species in 1939–40 and eleven species in 1940–41. The average number of each species present one or both years is listed in Table 1. The larger population for 1940–41 is accounted for chiefly by a flock of Purple Finches which wintered in the area the second year, and by a larger number of Tree Sparrows. During the first winter the Tree Sparrows were usually found along a roadside hedge outside, but this hedge was cut the second year and they moved inside the study area. The absence of Red-headed Woodpeckers and the smaller number of Blue Jays in 1941 may have been caused by the poor acorn crop that year.

The data show 1.1 birds per acre in the winter of 1939–40, and 1.7 birds per acre in 1940–41 (an average of 1.4 birds per acre for two winters). The same birds did not stay in the area all the time. Likewise, some birds recorded on each trip doubtless wandered in from an adjacent territory. It is probable that the population counted in the area during the majority of the winter trips was representative of the actual population. Forbes and Gross (1923) gave a figure of .7 birds per acre in central Illinois in the winter of 1906–7, referring chiefly to open country and not to forests.

TABLE 1
Winter Bird Population

	1939–40	1940–41
Red-bellied Woodpecker (*Centurus carolinus*)	4	2
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	3	0
Hairy Woodpecker (*Dryobates villosus*)	0	1
Downy Woodpecker (*Dryobates pubescens*)	4	5
Blue Jay (*Cyanocitta cristata*)	10	4
Black-capped Chickadee (*Penthestes atricapillus*)	6	7
Tufted Titmouse (*Baeolophus bicolor*)	6	8
White-breasted Nuthatch (*Sitta carolinensis*)	2	3
Cardinal (*Richmondena cardinalis*)	4	8
Purple Finch (*Carpodacus purpureus*)	0	15
Slate-colored Junco (*Junco hyemalis*)	8	12
Tree Sparrow (*Spizella arborea*)	3	12
	50	77

The numbers making up the winter population were arrived at by listing under each date the number of birds of each species counted on that date. Then, going over the numbers listed for all the trips during the winter months, the number which occurred most frequently was taken as the probable population of that species.

Wind

The effect of wind on the local movements of the birds in this area was very striking. It is unfortunate that, because wind was considered a minor aspect of the study when it began, an anemometer was not used, and records of the velocity of the wind were based on my own impressions. The velocities used are as follows: strong means a violent wind; slight means a mild breeze. The contrasting effects of only extreme velocities will be illustrated.

The effect of the wind on distribution is illustrated clearly in Figure 2. The birds included in this figure are winter residents and early spring migrants. The strongest winds and most marked effects on bird distribution occurred in March after the first migrants had appeared. Therefore these maps may be considered as recording distribution in late winter or very early spring. The two diagrams on the left in Figure 2 show the contrasting distribution of the birds on days with slight and with strong winds blowing from the northwest. The slight northwest wind had little effect on the birds, as they were spread all over the area. A strong northwest wind seemed to have caused the species to stay in the sheltered parts away from the blasts, as nearly all of them were on the east side and behind the protecting bluff.

The two diagrams on the right in Figure 2 present a most interesting point. These two maps were made on two consecutive days, March 15 and March 16, 1941. On March 15, a very strong wind was blowing from the south, and every bird in the woodland with the exception of one lone Blue Jay was found on the low, north-exposed floodplain, sheltered from the wind by the high river bluff. The following day the wind did a complete reverse and blew with tremendous force from the north. The floodplain, so well-populated the previous day, was this day deserted, and all the birds were found along the creek bottoms at the base of the south side of the bluff, well sheltered from the north wind's blasts.

The conclusion apparent from a study of these figures is that a slight wind has little or no effect on the distribution of birds in this forest, but a strong wind appears definitely to influence their movements. During this research, I made 39 maps of the distribution of birds during winter days, and they support fully the conclusion here drawn. Carpenter (1935) found that "the 'lee' side with reference to prevailing winds had by far the greatest bird population in all seasons observed," but he did not demonstrate day by day shifts with the changing direction of a strong wind.

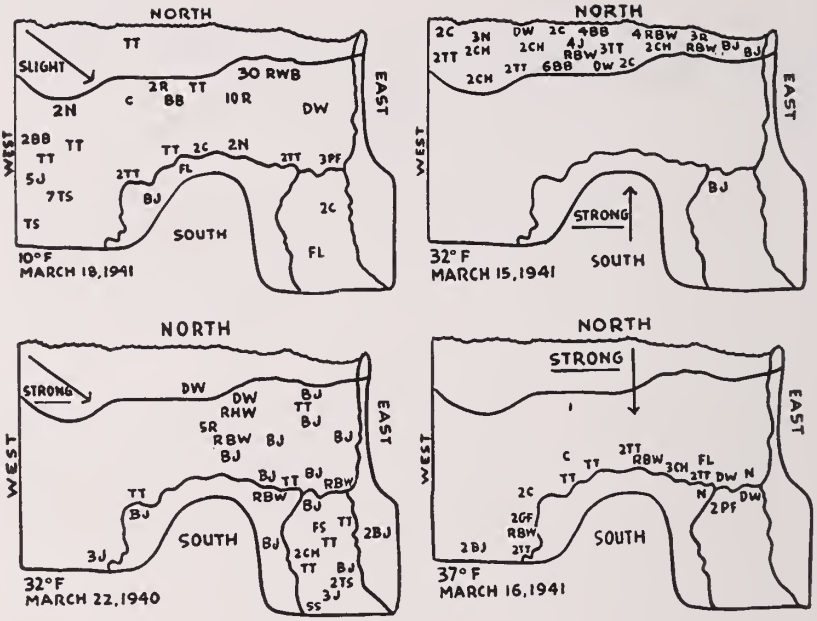

Figure 2. Maps illustrating the comparative effects of slight winds and strong winds on bird distribution. The arrows indicate wind direction.

Symbols:

FL—Flicker	BB—Bluebird
RBW—Red-bellied Woodpecker	RWB—Eastern Red-wing
RHW—Red-headed Woodpecker	C—Cardinal
DW—Downy Woodpecker	PF—Purple Finch
BJ—Blue Jay	GF—Goldfinch
CH—Black-capped Chickadee	J—Junco
TT—Tufted Titmouse	TS—Tree Sparrow
N—White-breasted Nuthatch	FS—Field Sparrow
R—Robin	SS—Song Sparrow

Temperature

The second factor which had an effect on both the activity and the distribution of birds in winter was temperature. Practically without exception, on days when the thermometer registered 25° F. or lower, all birds observed spent their entire time in feeding or hunting for food. When the temperature rose well above 25°, much time was still devoted to feeding, but some was now spent in preening and singing. This was generally true of each species, but especially of Titmice, Chickadees, Nuthatches, and Cardinals.

As an illustration of the effect of temperature on activity, I mention data for January 12, 1941. Cold weather had been constant just before this date, but on the twelfth the temperature was 29° at 7 A.M. and rose

to 58° by twelve noon. Titmice were observed chasing each other; they were scattered over the entire area in two's and three's, and were singing *peto-peto-peto* constantly. Chickadees moved over the area, singing *phoe-be* and answering each other; and a White-breasted Nuthatch was observed flashing the white in its tail feathers. On this warm, sunshiny morning in midwinter, the temperature rose to a spring level, and many of the birds reacted accordingly with spring behavior. A week later, on January 19, the temperature had gone down below 23° and the Titmice, Nuthatches, and Chickadees resumed their winter behavior, feeding constantly and singing little. What else but temperature could have caused such a decided change in activity in midwinter?

The effect of temperature on the social behavior of Titmice, Nuthatches, Chickadees, and Downy Woodpeckers proved interesting. In cold weather, 25° or below, these species tended to flock together and feed in groups. In warmer weather, above 25°, they tended to spread out and scatter over the area. My notes on flocking agree with the conclusion of Wilbur Butts (1931) that "the association of chickadees, nuthatches, and woodpeckers is only a temporary one." None of the many flocks which I watched stayed together for more than an hour. The average number of birds in a flock was ten or eleven, and an average flock consisted of five Titmice, three Chickadees, one Nuthatch, and one Downy Woodpecker. The birds had a tendency to flock early in the morning when the temperature was low and to spread out as the day grew warmer. This leads to the suggestion that flocking may be subject to daily rhythm, varying with the temperature, but this needs confirmation.

In addition, temperature had an apparent influence on the phytovertical occurrence of certain species. To secure food in cold weather, Titmice, Chickadees, Blue Jays, and Cardinals came down to the ground much more frequently than they did in spring, summer, and autumn. This is probably only partially a result of temperature.

Sun and Precipitation

Sun and precipitation are often considered important factors in the winter activity of birds. During the thirty-nine days of my study, the birds seemed to be equally active on sunshiny days and on cloudy days, with or without precipitation.

Summary

A second-growth forest along the Sangamon River in central Illinois consisted of forty-six acres of four chief habitats—(A) a low moist floodplain (B) a high river bluff (C) an open upland forest and (D) a forest-edge.

Trips were made to this area once or twice per week during the winters of 1939–40 and 1940–41. On each trip the distribution of the birds was carefully mapped and notes were taken on their activities.

The average winter population during the two winters was 1.4 birds per acre, and included ten and eleven species respectively.

A strong wind caused birds to seek sheltered areas and changes in the direction of the wind brought about day-by-day movements from one part of the area to another. A slight wind had little or no effect.

Low temperature caused birds to feed almost constantly and to sing little, whereas a rise in temperature decreased feeding and increased singing.

Black-capped Chickadees, Tufted Titmice, Downy Woodpeckers, and White-breasted Nuthatches showed a tendency to form flocks at temperatures below 25° and to scatter when the temperature rose above 25°.

As far as could be determined, sun and precipitation had no effect on the winter activity of birds in this study.

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NOTES ON BIRDS OF THE MONTERREY DISTRICT OF NUEVO LEON, MEXICO

BY GEORGE MIKSCH SUTTON, OLIN SEWELL PETTINGILL, JR., AND ROBERT B. LEA

THE Cornell University-Carleton College Expedition visited the Monterrey district of Nuevo Leon on February 25–27 and May 5–9, 1941. In February we worked the flat country north of the city (at about 1,500 feet elevation). In May, activities centered on the Mesa de Chipinque (elevation about 5,000 feet), though a brief trip to the village of Santa Rosa, 12 miles northeast of Monterrey, was made on May 9. The following list includes all species actually collected about Monterrey, as well as two taken near Canoas, a village just north of Montemorelos.

We are grateful to John W. Aldrich for his courtesy in lending series of *Atlapetes pileatus* (including the type of *A. p. dilutus*) and *Toxostoma longirostre;* to Josselyn Van Tyne, for lending a series of *Caprimulgus vociferus arizonae* and for comparing three *Pipilo maculatus* specimens with the type of *P. m. gaigei;* and to Lloyd Hulbert, a graduate student at Cornell University, for his excellent photograph of the series of *Accipiter striatus.*

Elanus leucurus (Vieillot). White-tailed Kite. A single bird was seen several times flying over the flat country north of Monterrey, February 26 and 27.

Accipiter striatus suttoni van Rossem. Mexican Sharp-shinned Hawk. A breeding male and female, taken at the Mesa de Chipinque May 5–6, exhibit clearly the faintly barred underparts and solidly brown flags of this race. In both specimens the eyes were dark reddish-brown. The female had a well defined brood-patch. The accompanying photograph shows the type and three topotypes of *suttoni,* with an average male and female *velox* from the eastern United States.

Otus asio (Linnaeus). Screech Owl. Three Screech Owls were taken: two females, in Anahuac Park, two miles north of Monterrey, February 25 and 26; and a male at the Mesa de Chipinque, May 5.

Cornell University now has three topotypical *O. a. semplei.* The type (at Carnegie Museum) is a gray-phase bird like two of these topotypes, but the race is definitely dichromatic, a male taken by Mr. Semple on March 18, 1939 (see Sutton and Burleigh, 1941: 159) being a very red bird with the usual distinctive feather-patterns of that color-phase. The 1941 male measures: wing, 159; tail, 79.

The two above-mentioned Monterrey females are puzzlingly intermediate in color-phase. Both are strongly reddish throughout, but the feather-patterning is that of gray-phase birds. They measure: wing, 158, 160; tail, 81, 79. Strictly comparable material must be obtained before we can be sure what Screech Owl occurs at Monterrey. Sutton has long believed *semplei* to be a montane race, and *mccallii* to be the Monterrey bird, but this concept may be wrong.

Bubo virginianus pallescens Stone. Western Horned Owl. A faded female taken in Anahuac Park, 2 miles north of Monterrey, February 26, has buffy white, immaculate toes and lower tarsi. Its small size (wing, 344 mm.) indicates some approach to *mayensis* (see Griscom, 1935: 547). A very small male Horned Owl (wing, 315) taken near Linares, 80 miles south of Monterrey, has been identified as *mayensis* (Sutton and Burleigh, 1941: 159).

Caprimulgus vociferus setosus van Rossem. Mexican Whip-poor-will. Four breeding specimens (3 males, 1 female) were taken at the Mesa de Chipinque, May 5. In identifying these birds, three *C. v. setosus* (a male topotype, from Galindo, Tamaulipas; a female from Realito, Tamaulipas; and a breeding male from Las Vigas, Veracruz), and a series of *C. v. arizonae* (four virtual topotypes and ten birds from the Chisos Mountains, Brewster County, Texas) were used for comparison. In darkness and dullness throughout, our Mesa de Chipinque birds agree with the three *setosus,* thus extending the known range of this form eastward from "southern Coahuila" (Oberholser, 1914: 12, footnote) and northward from central Tamaulipas (Peters, 1940: 199) to include mountainous parts of western Nuevo Leon. The Chisos Mountains birds vary considerably and as a lot appear to be intermediate between *arizonae* and *setosus,* the females tending to look like the former, some of the males like the latter.

The detailed diagnosis of the Mexican Whip-poor-will (at that time known as *macromystax*) in Brewster's original description of *C. v. arizonae* caused us considerable confusion until we examined a specimen of *Caprimulgus serico-caudatis salvini* to find that, point for point, the bird Brewster believed to be the Mexican Whip-poor-will and was using for comparison was in fact this superficially similar but actually quite distinct species.

Chloronerpes aeruginosus (Malherbe). Mexican Green Woodpecker. Seen repeatedly on the Mesa de Chipinque. Two occupied nests found (at about 5,000 feet and 5,500 feet) and a male with much enlarged testes and well-defined brood-patch taken on May 7.

Nuttallornis borealis (Swainson). Olive-sided Flycatcher. Noted but once, May 7, when a female was taken at about 6,000 feet on the Mesa de Chipinque.

Empidonax difficilis Baird. Western Flycatcher. Male, with much enlarged testes, taken May 8 at about 7,000 feet on the Mesa de Chipinque. The Western Flycatcher of the Mesa has been identified as *E. d. hellmayri* (Sutton and Burleigh, 1941: 159). But after comparing the four available specimens with seasonally comparable, topotypical *hellmayri,* we are convinced that they are brighter throughout than that form, greener above, yellower on the belly, more brownish olive on the chest—and that they represent one of the links in the chain of races (*immemoratus, occidentalis, salvini, dwighti,* etc.) connecting the dull *hellmayri* with the bright *flavescens* of Costa Rica. We consider it inadvisable, however, to bestow a separate name on them at this writing, since they probably are very close to one of the above-named races. They measure: wing, 70.5, 71.5, 70, 72 mm.; tail, 62.5, 63, 60, 64 (average, wing, 71, tail, 62.3).

Troglodytes brunneicollis cahooni Brewster. Cahoon's Brown-throated Wren. Noted infrequently on the Mesa de Chipinque at from 5,500 to 7,000 feet. Nest with half-grown young found in hole in cliff along trail leading to top of mountain (at about 6,000 feet), May 8.

Thryothorus ludovicianus berlandieri Baird. Berlandier's Wren. Noted repeatedly at Monterrey and on the Mesa de Chipinque. Female taken along the main highway near the village of Canoas, just north of Montemorelos, February 27.

Toxostoma longirostre sennetti (Ridgway). Sennett's Long-billed Thrasher. We have compared a male specimen taken two miles north of Monterrey, February 26, with a series of nine January and February *T. l. longirostre* from Puebla, Veracruz, San Luis Potosi, and the State of Mexico. Our specimen is noticeably grayer above than any of these though not strikingly whiter below. Its measurements (wing, 96; tail, 126.5: exposed culmen, 27) indicate *sennetti.*

Vireo griseus griseus (Boddaert). Northern White-eyed Vireo. Male (wing, 61 mm.; tail, 53.1) taken 2 miles north of Monterrey, February 26. Though the testes of this bird were noticeably enlarged (3 x 4 mm.) we did not hear it singing, so it probably was a transient on its way northward. The breeding race of the Monterrey district is said to be *V. g. micrus* (see Hellmayr, 1935: 114).

Polioptila caerulea amoenissima Grinnell. Western Blue-Grey Gnatcatcher. Gnatcatchers were seen repeatedly in the brush country north of Monterrey. The only specimen taken (female?, February 26) has the grayish throat and breast and dark upper parts that characterize this race. The wing measures 50 mm., the tail, 55.

Vermivora celata celata (Say). Eastern Orange-crowned Warbler. Noted several times at Anahuac Park, north of Monterrey, where a female (molting on throat) was taken February 26.

Richmondena cardinalis canicauda (Chapman). Gray-tailed Cardinal. A male (wing, 89 mm., tail, 97) taken 2 miles north of Monterrey, February 27, is a bright, well plumaged example of this race. The testes were only slightly enlarged.

Cyanocompsa parellina (Bonaparte). Blue Bunting. Two females, taken along the main highway near Canoas, February 27, are obviously smaller-billed and paler than *C. p. parellina* from central Veracruz, but whether they are *C. p. beneplacita* or *C. p. lucida* we cannot say, for we have thus far been unable to find any character by which females of these two races can be distinguished.

Passerina versicolor versicolor (Bonaparte). Varied Bunting. Recorded with certainty but once, when an adult male was taken 9 miles north of Monterrey along the road to Santa Rosa, May 9.

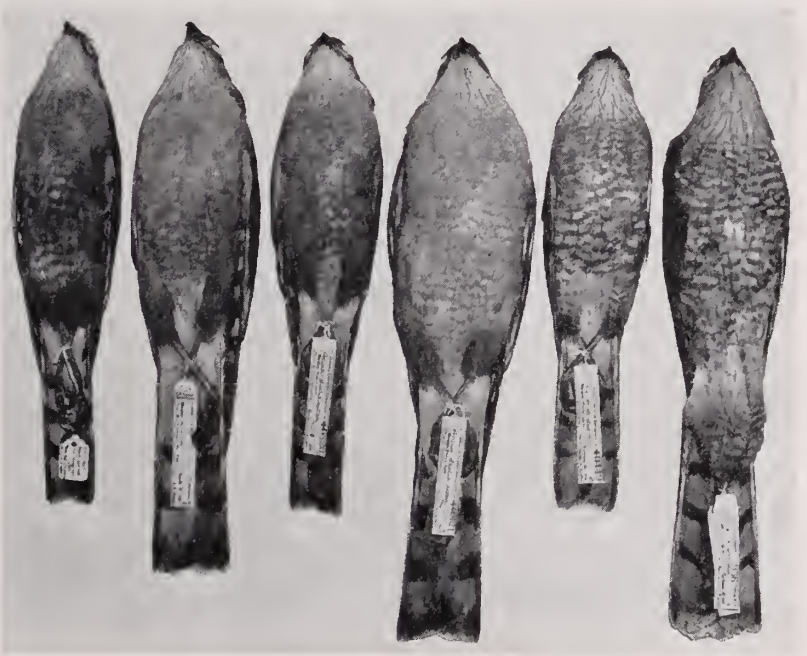

Figure 1. Adult Sharp-shinned Hawks. The four at the left are *Accipiter striatus suttoni* (type at extreme left) from the Mesa de Chipinque, Nuevo Leon. The two at the right are average *A. s. velox*. The females are instantly distinguishable because of their large size.

Atlapetes pileatus dilutus Ridgway. Chihuahua Rufous-capped Sparrow. Several specimens of this finch were taken by the first Semple Expedition at the Mesa

de Chipinque February 9–14, 1938. On comparison with the type of *A. p. dilutus,* these were thought to be too yellow below and not gray enough above for that race, hence were reported as *A. p. pileatus* (Sutton and Burleigh, 1939: 45). The following year, on April 8, two more specimens were obtained near Jacala, Hidalgo. These were much yellower below than the Mesa birds, in spite of the fact that they had been subjected to several weeks more wear and exposure.

Interested in determining to what extent color of underparts might vary seasonally, Sutton collected a breeding pair of Mesa birds on May 7, 1941. These proved to be very pale below, much paler than the palest February specimen taken in 1938. Were these pale birds *dilutus?*

The U. S. Fish and Wildlife Service courteously lent us their entire series of 15 *Atlapetes pileatus,* including the type of *dilutus.* Examining these, together with the seven adult Nuevo Leon and Hidalgo specimens at present in the Cornell collection, we find (1) that Nuevo Leon birds and the type of *dilutus* are definitely the palest and dullest below of the lot; (2) that by far the most richly colored individual of the whole series is a *female* taken February 10, 1893, at Tetela del Volcan, Morelos; and (3) that birds from more southerly latitudes of Mexico (Veracruz, Jalisco, Puebla, Guerrero, and Michoacan) all tend to be bright yellow below and brown-backed in comparison with the Mesa de Chipinque series, the one Hidalgo bird referred to above being about halfway between the very pale and very bright extremes.

Our study convinces us that the type of *A. p. dilutus* (April) was a faded bird. Collected in 1884, it probably has faded still more with the passing of the years. We nevertheless believe *dilutus* to be valid, and offer the pale-bellied, though freshly plumaged, Mesa de Chipinque birds as evidence. The six specimens measure: males, wing, 61-67 mm. (av. 64.5); tail 63–70 mm. (av. 67); females, wing, 59.5, 60.5; tail 59, 61.

Two young birds just out of the nest were also collected at the Mesa on May 7, 1941. These are obscurely colored—dull brown above; somewhat yellow on the throat; light buffy, washed with yellow, on the belly.

Arremonops rufivirgatus rufivirgatus (Lawrence). Texas Sparrow. Noted repeatedly about Monterrey and on the Mesa. A female taken in Anahuac Park, north of Monterrey, February 26, is darker chested than topotypical specimens from Brownsville, Texas, in this respect showing some approach to *A. r. ridgwayi.* A juvenal female (tail, 40 mm.) taken on the Mesa, May 6, was being fed by its parents.

Pipilo maculatus gaigei Van Tyne and Sutton. Gaige's Spotted Towhee. Three breeding males taken at the Mesa de Chipinque, May 8, have been directly compared with the type of *gaigei* and are considered by Van Tyne to belong to that race. Two of these birds appear to be in their first breeding plumage.

Aimophila cassinii (Woodhouse). Cassin's Sparrow. Fairly common in plains country north of Monterrey, where a female was taken February 27.

Aimophila ruficeps boucardi (Sclater). Boucard's Sparrow. A breeding male (testes 5 x 7 mm.) collected May 8 in a dry gully below the Mesa de Chipinque (at about 4,000 feet), has the dark crown-patch and measurements (wing 62 mm.; tail, 65.5) of this race. That Nuevo Leon is not included by Hellmayr (1938: 530) in the range of *boucardi* is probably merely an oversight.

Amphispiza bilineata bilineata (Cassin). Black-throated Sparrow. Noted repeatedly in opener country north of Monterrey. On May 9 an adult male and two stub-tailed juvenals were collected. The smallness of the male (wing, 62.5 mm.; tail, 58.) and reduced white patch on the outermost rectrix (about 13 mm. long) indicate that this race, rather than *grisea,* is the breeding form of the region.

Spizella pallida (Swainson). Clay-colored Sparrow. Noted repeatedly in opener country about Monterrey in February, but not in May. Female taken February 26.

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FREQUENCY OF OCCURRENCE OF SUMMER BIRDS AT THE UNIVERSITY OF MICHIGAN BIOLOGICAL STATION [1]

BY KATHERINE A. WHITE [2]

THE need of an accurate and uniform method of expressing the results of bird population studies has long been recognized. Quantities of data already available are of little value because of the inexactness and variation of method used by field investigators.

In making a study of the bird population in the vicinity of the University of Michigan Biological Station during the summer of 1941, I applied Raunkaier's Law of Frequence. This method of study is an adaptation of a system used by botanists in analyzing populations of plants.

Raunkaier, a Danish botanist, based his law on eleven different botanical investigations carried on by himself and others in Europe. Kenoyer (1927) states the law as follows: The percentage of frequence of a given species is the percentage ratio which the plots on which the species occurs bears to the whole number of plots taken. Kenoyer also explains its application as follows: using at least 25 plots, the number of species on each plot is counted. Then to determine frequence of the species on 25 plots, the number of plots on which any one species is found is divided by 25. If a species is found on each plot, the frequence is 25 divided by 25, or 100 per cent; if it is found on 5 plots, the frequence is 5 divided by 25, or 20 per cent. In making a number of such surveys, it was usually found that there were larger numbers of species of low frequence than of higher frequences. As one proceeds to the greater frequences, the number declines steadily until the highest (or next highest) frequence is reached, at which point it increases slightly. To express this in a formula, Raunkaier let A, B, C, D, and E represent frequences from 1–20 per cent, 21–40 per cent, 41–60 per cent, 61–80 per cent, and 81–100 per cent respectively. The distribution of the frequences could then be expressed:

$$A > B > C \gtreqless D < E$$

Kenoyer was the first to suggest the use of Raunkaier's Law in making animal population studies, while Linsdale (1928, 1932, 1936; Linsdale and Rodgers, 1937) was the first to apply the law to bird life.

Linsdale (1932) points out several advantages in the use of Raunkaier's Law in studying bird populations:

[1] Contribution from the University of Michigan Biological Station.

[2] I wish to express my appreciation to Dr. Olin Sewall Pettingill, Jr. of Carleton College, Northfield, Minnesota, for numerous suggestions concerning the keeping of proper records, source material of similar studies, and especially for the reading and constructive criticism of the manuscript for publication. I am also grateful to Dr. Jean M. Linsdale of the Museum of Vertebrate Zoology, Berkeley, California, for several helpful suggestions and his explanation of a similar bird frequency study made in northern Michigan.

1. It gives a more nearly correct impression of the relative abundance of birds than any other method.
2. It makes it possible to analyze the composition of the bird population.
3. It makes it possible to compare the population of one locality with that of other localities and regions.
4. Over a period of time birds are likely to be observed on a certain area on the number of occasions which parallels their abundance.

Linsdale (1932) also points out several factors which decrease the reliableness of this method:

1. Nocturnal birds will be slighted, as will be small birds of retiring habits.
2. The numbers of birds observed will be affected by weather conditions.
3. Daily variations in the route and distribution of attention of the observer will also affect the birds recorded.

The 1941 Study at Douglas Lake

The University of Michigan Biological Station is located on South Fishtail Bay at the south end of Douglas Lake in Cheboygan County, Michigan. Douglas Lake lies about midway between Lake Michigan and Lake Huron and about thirty miles below the northern end of the Lower Peninsula. The territory covered by this study included four routes:

Route 1. The shore of the lake from the Station area to North Fishtail Bay (2½ miles).
Route 2. The woodland lying northeast from the Station to North Fishtail Bay (2 miles).
Route 3. State Street, the main street of the Station which is lined on either side by student and faculty cabins (½ mile).
Route 4. The hill immediately south of the Station (1½ miles).

The shore is barren of vegetation throughout most of the territory covered. It is bordered with white pines (*Pinus Strobus*) intermingled with a few aspens (*Populus grandidentata* and *P. tremuloides*) and red pines (*Pinus resinosa*). The woodland consists mainly of an aspen-birch association which gradually changes to an association of conifers as one progresses northward from the Station. The trees found there are aspens, red maple (*Acer rubrum*), white birch (*Betula alba* var. *papyrifera*). beech (*Fagus grandifolia*), white and red pine, red oak (*Quercus borealis*), and wild cherry (*Prunus* sp.). Also present are such shrubs as sumac (*Rhus typhina*), service berry (*Amelanchier canadensis*), and alder (*Alnus incana*). The conifer area consists mainly of white cedar (*Thuja occidentalis*), and balsam (*Abies balsamea*). The trees found around the camp and laboratories of the Station consist mainly of red

TABLE 1

FREQUENCY OF SPECIES OCCURRENCE AND NUMBERS OF INDIVIDUALS OBSERVED

The 80 species recorded	Number of days seen	Per cent of frequency	Total individuals	Rank in numbers	Rank in frequency
Black-capped Chickadee	30	100	666	2	A
Cedar Waxwing	30	100	567	3	A
Robin	30	100	512	4	A
Kingbird	30	100	399	7	A
Red-eyed Vireo	30	100	282	8	A
Spotted Sandpiper	30	100	264	10	A
Wood Pewee	29	96.7	124	12	A
Purple Martin	28	93.3	1271	1	A
Ring-billed Gull	27	90	477	5	A
Chipping Sparrow	27	90	212	11	A
Least Flycatcher	25	83.3	117	14	C
Black and White Warbler	25	83.3	87	18	C
Herring Gull	25	83.3	74	21	C
Blue Jay	24	80	276	9	C
Flicker	24	80	124	12	C
Oven-bird	24	80	109	15	C
Song Sparrow	23	76.7	77	19	C
Purple Finch	23	76.7	71	23	C
Caspian Tern	23	76.7	66	25	C
Baltimore Oriole	22	73.3	121	13	C
Nighthawk	22	73.3	103	16	C
Rose-breasted Grosbeak	21	70	75	20	C
Redstart	21	70	46	28	C
Goldfinch	20	66.7	70	24	C
Cowbird	20	66.7	53	26	C
Hairy Woodpecker	17	56.7	39	30	M
Mourning Dove	17	56.7	36	32	M
Bank Swallow	16	53.3	433	6	M
Downy Woodpecker	16	53.3	37	31	M
Common Tern	15	50	71	23	M
Brown Thrasher	15	50	49	27	M
Red-eyed Towhee	15	50	44	29	M
Crested Flycatcher	15	50	39	30	M
Black-billed Cuckoo	15	50	24	35	M

Rough-winged Swallow	9	30	27	34	U
Hermit Thrush	9	30	15	42	U
Vesper Sparrow	8	26.7	16	41	U
Yellow-billed Cuckoo	7	23.3	13	44	U
Phoebe	7	23.3	8	47	U
Northern Yellow-throat	6	20	9	46	U
Canada Warbler	6	20	9	46	U
Great Blue Heron	5	16.7	10	45	U
Catbird	5	16.7	5	49	U
American Merganser	4	13.3	34	33	U
Barn Swallow	4	13.3	23	36	U
Black Duck	4	13.3	14	43	U
Wood Thrush	4	13.3	8	47	U
Goshawk	4	13.3	6	48	U
Bald Eagle	4	13.3	4	50	U
Red-wing	3	10	18	40	U
Common Loon	3	10	4	50	U
Chestnut-sided Warbler	3	10	4	50	U
Least Sandpiper	3	10	3	51	U
Nashville Warbler	3	10	3	51	U
Blackburnian Warbler	3	10	3	51	U
Blue-winged Teal	2	6.7	13	44	R
Red-breasted Nuthatch	2	6.7	3	51	R
Sharp-shinned Hawk	2	6.7	2	52	R
Tree Swallow	2	6.7	2	52	R
Winter Wren	2	6.7	2	52	R
Solitary Sandpiper	1	3.3	2	52	R
Whip-poor-will	1	3.3	2	52	R
Slate-colored Junco	1	3.3	2	52	R
Red-breasted Merganser	1	3.3	1	53	R
Greater Yellow-legs	1	3.3	1	53	R
Ruby-throated Hummingbird	1	3.3	1	53	R
House Wren	1	3.3	1	53	R
Veery	1	3.3	1	53	R
Parula Warbler	1	3.3	1	53	R
Yellow Warbler	1	3.3	1	53	R
Myrtle Warbler	1	3.3	1	53	R
Field Sparrow	1	3.3	1	53	R
White-throated Sparrow	1	3.3	1	53	R

The bird names used in this table are taken from the A.O.U. Check-list of 1931.

oak, red maple, pin cherry (*Prunus pennsylvanica*), and birch; numerous sumac bushes are also found around the cabins. Grasses, clover, blueberries, and bracken (*Pteris aquilina*) form the main ground cover.

In order to divide the early mornings among the four routes I arranged a four-day schedule of walks. Four walks were made each day beginning on the following hours: 5:00 A.M.; 7:30 A.M.; 2:00 P.M.; 4:30 P.M. The routes covered were rotated each day so that in a period of four days, each route was traversed at a different time of day.* The weather conditions each day were noted and recorded.

Thus the material serving as a basis for this analysis consists of 120 lists of species; 30 lists for each of four different habitats visited each day for a total of 30 days between July 2 and August 14, 1941. The birds heard as well as those seen were recorded in each case. The per cent of frequence for each species was derived by dividing the number of days on which the species was observed by the total number of days, namely, 30. A separate list of frequences for each of the four habitats was made in addition to a composite list for the entire area. The total numbers of each species were recorded and it was found that the species seen in largest numbers were generally those seen most frequently.

One study of bird frequences was made in the vicinity of the Biological Station by Linsdale (1936) during the summer of 1924. Linsdale based his percentages on 50 days' field work. His study area was much larger and less compact than mine. He included, for example, several trips to points on both Lake Huron and Lake Michigan. The results of our two studies cannot, therefore, be satisfactorily compared.

Table 2 shows the number of species found in each frequence-class and the ratio between the number of species in each class and the total of species both for the present study and for Linsdale's studies.

TABLE 2

	Present study		Linsdale's studies					
			Michigan		Kansas		California	
	No. of species	Ratio	No. of species	Ratio	No. of Species	Ratio	No. of Species	Ratio
Class A	34	.43	62	.59	133	.68	111	.73
Class B	11	.14	16	.15	32	.16	20	.13
Class C	10	.12	11	.10	13	.07	7	.05
Class D	12	.15	10	.09	6	.03	5	.03
Class E	13	.16	5	.05	10	.05	8	.05

It will be noted that there are more species of high frequences in the present study than in the previous studies by Linsdale. This is due

* The trip to North Fishtail Bay and back (Routes 1 and 2) covered a period of approximately five hours; the route along State Street (Route 3), forty-five minutes; and the hill (Route 4), one and one half hours.

to two factors: (1) Exactly the same territory was covered each day. This was not the case in the earlier studies. (2) The bird population was more stable and homogeneous due to the fact that the study extended only through the breeding season and few non-breeding birds were included.

Table 1 shows the species seen during the period of observation, listed in order of decreasing frequence; it shows the number of days on which the species was seen, the per cent of frequence, the total number of individuals of each species recorded, the rank in number (the species observed in greatest abundance ranks first and the one seen in least abundance ranks fifty-third), and gives a frequence rating according to the following scale:

A (abundant)	90 to 100 per cent frequence
C (common)	65 to 89 per cent frequence
M (moderately common)	31 to 64 per cent frequence
U (uncommon)	10 to 30 per cent frequence
R (rare)	1 to 9 per cent frequence

The fact that the frequences agree very closely with the total numbers of individuals seen bears out Linsdale's statement (1932:225) that the numbers of individual birds of one species seen over a period of time will parallel the frequence of occurrence of that species. The chief exceptions in my study to this statement were the Purple Martin, the Bank Swallow, and the Herring Gull. The exceptionally high number of Martins and Bank Swallows was due to the presence at the Station of colonies of each. Both groups migrated before the end of the period of observation, thus preventing them from showing a frequence of 100 per cent. The number of Herring Gulls recorded was much less than the number of Ring-billed Gulls although the frequences are almost the same. The flocks of gulls that fed on the lake were made up largely of Ring-billed Gulls, but a few Herring Gulls were always present.

The use of Raunkaier's Law of Frequence is a highly accurate method for determining the frequence of birds in a region of the type surrounding the Biological Station. It involves simple calculations and is easily represented graphically. At the same time, it gives a precise picture of the bird life of a habitat which can readily be compared with that of another habitat (when another habitat is studied in the same way) or with the bird life of the same habitat studied in the same way at a different time.

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Collinsville, Illinois

Ornithologists of the United States Army Medical Corps. By Edgar Erskine Hume, Johns Hopkins Press, Baltimore, 1940: 7 x 10 in., xxv + 583 pp., frontisp. and 109 figs. $5.00.

The publication of a volume of biographies of ornithologists is a notable event, especially when the author has done a scholarly job and the publishers a fine piece of book making.

We are all familiar with the British army officers' great tradition of natural history investigation in the remote parts of the earth but few Americans have realized the important part that has been played by United States Army officers, particularly those of the Medical Corps. Col. Hume, formerly Librarian of the U.S. Army Medical Library, is well qualified to be the biographer of the Army Medical Corps ornithologists and obviously he has worked long and faithfully. He started to write a brief paper but it soon grew into a series of articles, the first of which was actually published in the *Bulletin of the History of Medicine* in 1940. Fortunately the Johns Hopkins Press then decided to publish the manuscript in this handsome and much more convenient book form.

The thirty-six biographies are arranged in alphabetical order and contain a vast amount of new information as well as much that was never before thus correlated. At the close of each chapter is a list of the principal sources. Included in most of the biographies are excerpts of the subject's published and unpublished writings. Certain of the quotations strongly confirm this reviewer's old suspicion that ornithologists are commonly very bad poets.

There is an interesting foreword by Alexander Wetmore who properly calls attention to the important part that Baird had in promoting and encouraging the work of many of these pioneer ornithologists.

Col. Hume modestly disclaims any knowledge of ornithology but his book contains much evidence to the contrary. Our confidence in the reliability of the book is partly the result of our almost complete failure to detect typographical slips or errors of any kind. The usefulness of the book is enhanced by an excellent index.—J. Van Tyne.

GENERAL NOTES

A Golden Plover in Central New York in Spring.—On March 21, 1942 a Golden Plover (*Pluvialis dominica dominica*) was found in an upland field close to Cayuga Lake, Kings Ferry, Cayuga County, New York by a group of Cornell University ornithology students which included myself. It was in company with three Killdeers (*Charadrius vociferus*). The next day, accompanied by Harrison Tordoff and Herbert Bleich, I returned and found the bird again in exactly the same place. It was feeding busily despite an inch of snow which had fallen during the night. The plover was collected and is now in the Louis Agassiz Fuertes Memorial Bird Collection at Cornell University. Mr. Lloyd Hulbert made a complete dissection and found it in excellent condition with no apparent injuries or disorders of any sort. The full stomach contained earthworms (*Lumbricus*) and numerous disintegrated insect remains. The specimen is a male in winter plumage. The testes were very small, 1 x 3 mm.

I am aware of very few authentic spring records of the Golden Plover in New York State: April 7, 1882 (one) and May 10, 1885 (two), both from Shinnecock Bay, Long Island (E. H. Eaton, Birds of New York, 1, 1910: 347). A. C. Bent (*U.S. Nat. Mus. Bull.*, 146, 1929: 190) gives records for Long Island City, April 17, and Fair Haven Light, May 3, but does not give the source. W. Sedwitz (*Proc. Linn. Soc. N.Y.* Nos. 50–51, 1940: 55) reports one seen in the New York City region on April 18, 1937. There is apparently no previous spring record for the Finger Lakes region.—Robert M. Mengel, *Cornell University, Ithaca, New York.*

A Nest of the Acadian Owl in Michigan.—On May 1, 1942, I discovered an adult Acadian Owl (*Cryptoglaux acadica*) and her brood of seven young in an artificial squirrel den at the Swan Creek Wildlife Experiment Station in Allegan County, Michigan. The young ranged in age from approximately five days to two weeks. The smallest of the brood was downy and quite helpless, while the oldest was almost entirely feathered out.

The artificial squirrel dens in use at the experiment station are wooden boxes 18 inches high by 12 inches square made of one-inch pine lumber. The entrance, placed near the top of one side, is 3 inches in diameter. The box in which the owls were found is 21 feet high in a 13-inch (DBH) black oak (*Quercus velutina*) in an upland area composed mainly of second growth black oak and white oak (*Quercus alba*).

There are only two other records for the Acadian Owl in the experiment station files. One is of an adult found dead near the Kalamazoo River on October 25, 1939, and the other of one taken alive in a box trap on November 29, 1939.—Philip Baumgras, *Game Division, Michigan Department of Conservation, Lansing, Michigan.*

Western Burrowing Owl in Indiana.—On Sunday, April 12 of this year I collected a male Western Burrowing Owl (*Speotyto cunicularia hypugaea*) in McClellan Township, Newton County, Indiana. Apparently this is the second record for this species from Indiana, the first specimen having been taken April 16, 1924, in the dune region of Porter County by Ashley Hine (*Auk*, 41, 1924: 602).

The location for the 1942 record was about two miles from the Indiana-Illinois state line. Spotted from a car, the bird sat on a mound at the mouth of a woodchuck burrow atop the spoil bank of a dredge ditch bordering a county road. When struck with a charge of light shot, the owl pitched into the burrow. It was recovered from a depth of about five feet. The head and neck region of the owl was abundantly parasitized by two species of mallophaga *Philopterus*

sprotyti (Osborn) and *Kurodaia* sp., probably *K. pectinatum* (Osborn). Dr. B. B. Morgan of the University of Wisconsin identified the lice. The skin of this owl, prepared by Clinton Conaway, is now in the collection of the Purdue Wildlife Laboratory.

I was with Dr. W. H. Elder when he took a male Burrowing Owl that was the first Wisconsin record (*Passenger Pigeon*, 1, 1939: 62). The date of the Wisconsin record was Sunday, April 9, 1939. It is interesting that the first Indiana record was made on April 16, and the first Illinois record was made April 9, 1930 by E. L. Lambert (*Wilson Bulletin*, 42, 1930: 213). The collection dates for all of these owls fall within a calendar week. All of the birds were males. These facts may be pure coincidence. On the other hand they may indicate a tendency of male Western Burrowing Owls to move eastward in the spring.—Charles M. Kirkpatrick, *Department of Forestry and Conservation, Purdue University, Lafayette, Indiana.*

Strange Behavior of Two Cliff Swallows.—On July 7, 1940 while watching a colony of Bank Swallows (*Riparia riparia*) in the bank of the Ohio River three miles west of Henderson, Kentucky, we witnessed very peculiar actions on the part of two Cliff Swallows (*Petrochelidon albifrons*).

During a period of about ten minutes both birds entered holes in the midst of the Bank Swallow colony, and disappeared completely from sight. One bird only entered once, emerging in a short time; the other went into a different hole at least three times, remaining a minute or more in each instance. This procedure attracted no attention from any of the Bank Swallows, and we were unable to ascertain whether the holes thus entered were occupied. Many of the Bank Swallow holes, however, contained well-grown young. Both Cliff Swallows were collected and proved to be male and female, well past full breeding condition. No evidence of Cliff Swallow nests was found anywhere in the area, and no others of the species were seen during our two day stay.—Burt L. Monroe, *Anchorage, Kentucky* and Robert M. Mengel, *Cornell University, Ithaca, New York.*

Du Bus' Types of Cyanocorax unicolor and Sylvia taeniata.—The type locality of *Cyanocorax unicolor* was given in the original description (*Bull. Acad. Roy. Sci. Belgique*, 14, pt. 2, 1847, séance of Aug. 7: 103) simply as Mexico. It was later (Esquisses Ornithologiques, livr. 4, 1848: pl. 17 and text) restricted to Tabasco, although two localities in Oaxaca and also Vera Paz, Guatemala, were included in the range. Hellmayr (*Field Mus. N.H., Zool. Ser.*, 13, pt. 7, 1934: 58, footnote) has very properly challenged the supposition that this species could occur anywhere in Tabasco and suggested a re-examination of Du Bus' type in the Brussels Museum. I examined this type in July, 1939. It is definitely and in detail the specimen from which was drawn the description and subsequent plate. Du Bus had two other birds from Mexico, respectively from San Pedro, near Oaxaca, and Tepitongo, Oaxaca but both of them are young of the year and have parti-colored bills. These were mentioned by Du Bus but have no standing as co-types, although someone (probably Dubois) has marked one of them as such both on the label and in the catalogue. The type, collected by Auguste Ghiesbreght in "Tabasco," probably in the spring of 1838 or 1839, is a very good example, in color, and in size an extra large one (sex not indicated; wing, 172; tail, 165), of the race currently known as *Aphelocoma unicolor coelestis* Ridgway. That name of course becomes a synonym of *Aphelocoma unicolor unicolor* (Du Bus) and the south-central Mexican race will probably be known as *Aphelocoma unicolor concolor* (Cassin) *Proc. Acad. Nat. Sci. Phila.*, 4, 1848: 26). A critical re-examination of Cassin's type must be made, however, especially in view of the initial uncertainty of the type locality.

As to the purported type locality of *Cyanocorax unicolor,* both Pierce Brodkorb and E. A. Goldman inform me that there are no mountains in Tabasco anywhere nearly high enough to accommodate this cloud-forest species which south of the Isthmus of Tehuantepec has never been taken below 7,000 feet. The only explanation is either that Tabasco took in more territory then than now, or that Ghiesbreght (who definitely did some collecting in Tabasco) entered an adjacent part of Chiapas without being aware of the fact. Ghiesbreght secured other high mountain species in "Tabasco," such as *Turdus rufitorques* and *Peucedramus olivaceus. One* of these might have been secured in Tabasco through some fortuitous circumstance, but that all three could have come from there verges on the impossible.

Sylvia taeniata Du Bus (*Bull. Acad. Roy. Sci. Belgique, ibid.*: 104) has always been placed in the synonymy of *Sylvia olivacea* Giraud. The type, an adult male in the Brussels Museum, is from "Tabasco" and, although the catalogue does not so state, was without doubt collected by Ghiesbreght in the same locality as the type of *Cyanocorax unicolor.* It is the race now known as *Peucedramus olivaceus aurantiacus* Ridgway and that name now becomes a synonym of *Peucedramus olivaceus taeniata* (Du Bus). The wing and tail measurements of the type are 70 and 49.5 mm., respectively. Incidentally, Bonaparte's statement (Consp. Gen. Avium, 1, 1850: 309) that the subsequent plate (Esq. Orn. livr. 6, 1850: pl. 28) was from a specimen from San Pedro, near Oaxaca, is not correct. The type is the basis of the plate and I may add that Wilhelm Meise made a similar notation on the tag in 1938.

While it is certain that Chiapas, not Tabasco, is the type region of both of the above birds, I have no first hand knowledge of the topographical details of that state. Obviously a spot as close as possible to the Tabasco boundary should be selected, but a definite selection may well be left to Pierce Brodkorb, in view of his extensive work in Chiapas.—A. J. VAN ROSSEM, *University of California, Los Angeles.*

A Nest of the Brown Jay.—Among the commonest and most noticeable birds of southern Tamaulipas is the so-called *Papán,* or Brown Jay (*Psilorhinus morio*). It wanders about the brushy lowlands in companies of four or five to ten to twelve (often family parties, apparently) mobbing such enemy species as lynxes, owls, or human beings, and feeding on various fruits and insects and an occasional lizard, mouse, or nestful of young birds. It is exceedingly noisy, its customary call-note being a loud *pee-ah* that is followed by a "hiccup" resulting from the sudden inflation or deflation of its odd furcular pouch (see Sutton and Gilbert, *Condor,* 44, 1942: 160–165). It is decidedly gregarious, even during the nesting season. An alarm cry from any single Jay is sufficient to cause all the Brown Jays of the neighborhood to foregather promptly.

Along the Sabinas River, in the Gomez Farias region of Tamaulipas, Brown Jays came daily to the Rancho Rinconada where our party lived from March 12 to May 4, 1941. During this period we rarely saw a lone Brown Jay. As early as March 21, we watched a bird carrying material to an exposed crotch twenty feet from the ground, but this nest was never completed. Twig-carrying (which we interpreted as nest building) was observed almost daily throughout latter March and the whole of April. Two birds carrying twigs were seen on several occasions. Numerous partly built or old nests were found. These were broad, not very deeply cupped nor neatly lined, and usually in comparatively open woodland from fifteen to thirty feet from the ground.

The only occupied Brown Jay nest discovered during our stay at the Rancho was found by our aide, Maclovio Rodriguez, who happened to frighten the bird from its nest as he was thrashing through a wild pineapple thicket looking for tinamous, April 21. There were three eggs in it then.

We went to this nest several times during the following two or three days, finding the sitting bird (presumably the female) to be surprisingly wary. On April 23 one of our party, Robert B. Lea, climbed to the nest. There were six eggs. These evidently comprised the complete set, for when Lea returned, several days later, to take the photograph reproduced herewith, no more eggs had been added. They were uniform in coloration, all being buffy gray, thickly and evenly spotted with dark brown. They were not collected.—George Miksch Sutton, *Ithaca, New York,* and Olin Sewall Pettingill, Jr., *Northfield, Minnesota.*

A Robin Anting—On July 12, 1942, Dr. George M. Sutton and I watched a Robin (*Turdus migratorius*) "anting" on the Edwin S. George Reserve, near Pinckney, Livingston County, Michigan. Neither of us had ever observed "anting" in birds before and we were keenly interested in this unusual behavior.

We saw the Robin on a large ant hill that we estimated to be about five feet in diameter and nearly two feet high. This hill was situated in a growth of bushes and saplings near the edge of a swamp. The bird flew from the ant hill into a nearby bush when we first noticed it, but came back onto the hill a few moments after we had retired several paces. We observed that the bird appeared to pick up the ants in its bill, placing them at the base of the primaries, chiefly at the wrist joint, and occasionally at the base of the tail. We did not see any ants crawling up the legs of the bird. The bird was quiet throughout the period of observation and its actions appeared most definite and purposeful. The Robin left the ant hill when a car was parked nearby, but returned to the hill a few minutes after the people walked away.

Altogether the Robin spent at least fifteen minutes on the ant hill (9:10 to 9:20 A.M.). As far as we could determine, the bird appeared to be normal in every way. Its plumage was wet and disarranged. We believed that it had either bathed or had become wet from the heavy dew that was still on the bushes and grass. Although we saw no definite evidence of molt, the worn plumage of the bird indicated that the molt was about to begin. Sutton flushed a Robin and a Wood Thrush (*Hylocichla mustelina*) from this same ant hill on August 23 and both of these birds had short, newly molted tails.

Ants from the hill were identified by Professor Frederick M. Gaige as *Formica exsectoides exsectoides* (Linn.). These ants are good biters and do not sting. They are capable of spraying formic acid from their abdomens; in fact, Prof. Gaige characterized them as "one of the richest extruders of formic acid in North America."

The literature on the "anting" of birds has recently been reviewed by McAtee (*Auk*, 55, 1938: 98–105) and Nice (*Auk*, 57, 1940: 520–22).—Arthur E. Staebler, *University of Michigan Museum of Zoology, Ann Arbor, Michigan.*

European Starling Nesting in a Bank Swallow Burrow.—On May 9, 1942, while inspecting the walls of a large gravel pit about nine miles northwest of Albany, New York, I observed an adult Starling (*Sturnus vulgaris*) fly from one of the Bank Swallow (*Riparia riparia*) burrows there. The Starling carried a pellet of excrement in its bill, good evidence that it was attending young within.

In the afternoon of May 12, I again visited the gravel pit. Shortly after my arrival an adult Starling emerged from the burrow with a pellet of excrement which it dropped after flying about sixty feet.

This gravel pit lay near a surfaced and moderately traveled highway extending over rolling, open country in an agricultural community. Several rural homes and the usual complement of farm buildings were in the immediate neighborhood.

The walls of the pit, which had been excavated in a roughly circular manner over an area of perhaps three acres, were precipitous and varied in height from 15 to 30 feet. The burrow occupied by the Starling was in the deepest portion of the pit. Only two or three other Bank Swallow burrows were on the same face of the bank as the one occupied by the Starling. This bank face and the burrow entrance were directed north. However, just around a sharp promontory, a few feet southeast of the Starling's burrow, were some 60 additional Bank Swallow burrows either completed or in process of construction. Their entrances faced the east. The swallows themselves were swarming about these burrows, entering and emerging from them frequently.

Obviously the burrow occupied by the Starling had been excavated by Bank Swallows. It was three feet below the rim of the pit and about 25 feet above its floor. The opening to it had been eroded a little so that it was higher than wide. However, it was not large enough to permit insertion of my hand. The burrow itself was 19 inches deep. With a small flashlight I could plainly see the well constructed, grass nest and two young Starlings 5 to 6 days old. They appeared to be in good condition and intermittently broke forth in unison with the characteristic hunger call.

During the course of my examination, which comprised some 70 minutes, one of the adults approached with food two or three times. One parent, perhaps the same one, expressed vocal dissent at my presence on each of two or three fleeting aerial sorties. But within ten minutes after I had left the immediate vicinity an adult Starling entered the burrow with food for the young. Other Starlings obviously were nesting about the nearby farm buildings and from time to time some of them alighted in the tall trees at one side of the gravel pit.

In the more or less intensive observation and study of the Bank Swallow which I have carried on over a period of twenty years this is the first time that I have found a Starling occupying a burrow of that bird as a nesting place.—Dayton Stoner, *New York State Museum, Albany, New York.*

EDITORIAL

There will be no annual meeting of the Wilson Club this year. Our Council feels that the least we can do at this difficult time is to cooperate with the Government by saving gasoline and tires and simplifying transportation and housing problems in all possible ways. We shall miss the good fellowship of the meeting. We shall not hear our friends' reports on interesting work they have done and places they have visited. But our *Bulletin* will keep us informed and unified.

As for our business affairs, one item will demand our attention—the election of officers. This the Council feels may best be handled by (1) appointment, now, of a nominating committee; (2) preparation of a slate by this committee; (3) printing and distributing ballots to all members about the time the annual meeting would have been held; and (4) voting, by mail.

I hereby appoint Margaret Morse Nice, Herbert L. Stoddard and Jesse T. Shaver as our nominating committee.

Our secretary probably will not send out an annual letter this year, since that letter is concerned primarily with the numerous details of the annual meeting. In the December *Bulletin* there will be a report on the voting and other business.

Our Club is vigorous and full of good spirit, and cancellation of this year's meeting will not stop our growth. But there may be difficult times ahead. Many of our members already are serving in our country's armed forces and there is no telling how many more will go. The membership will have to be prepared to cancel the meeting in 1943 if necessary, and perhaps to get on with a smaller *Bulletin*. This may sound pessimistic, though I hope it does not. A possible advantage of war is that in the midst of the distress and bewilderment we suddenly perceive the true value of taken-for-granted things. If we were asked to put down in words what the United States is fighting for now, most of us would write 'democracy,' 'religious freedom,' 'the right of free speech,' and the like, but have in our minds and hearts all the while the investigations that are coming on so well but are only half-done, the manuscript that is almost completed, the plans for the expedition we want so much to make. Is it not, in the last analysis, the right to think and live and do the work that interests us, really what we are willing to give our lives in defending?—George Miksch Sutton.

New Federal regulations require that we turn in soon for scrap metal all old engravings which are no longer definitely needed for future publication. All engravings used in the *Bulletins* published at Ann Arbor are now in the Editor's files. Any author who wishes the engravings used in his contributions to the *Bulletin* should write immediately to the Editor and request that they be sent to him transportation collect. The only cost involved will be that of transportation.

Ornithological News

We have received word that the following Wilson Club members are now in the Army, Navy, or Marine Corps: Robert W. Allen, G. A. Ammann, F. S. Barkalow, C. Edward Carlson, Ben Coffey, Donald P. Duncan, R. P. Grossenheider, R. C. Hanson, Arthur S. Hawkins, Richard G. Kuerzi, Roger W. Lawrence, Robert B. Lea, Robert A. Lessard, Lester J. McCann, Frank J. Manz, Jr., Burt Monroe, W. R. Taylor, Leonard J. Uttal. James Boswell Young is now with the Department of Justice.

The Fish and Wildlife Service has moved to Chicago and set up temporary quarters in the Knickerbocker Hotel. Permanent quarters will be in the Merchandise Mart. The Section of Distribution and Migration of Birds, which includes the bird banding files, has been moved to the Patuxent Research Refuge at Bowie, Maryland. A liaison office is being kept in Washington, D. C.

WILDLIFE CONSERVATION

Destruction of Waterfowl by Oil.—Along the Atlantic coast of Canada large quantities of floating oil, most of it present as a result of war activities, caused the destruction in three local areas of some thousands of seabirds during the latter part of the winter of 1941–42. The areas in which such destruction chiefly occurred were the Grand Manan Archipelago, on the southwest coast of New Brunswick; part of the coast of Shelburne County, in extreme southwestern Nova Scotia; and a part of the coast of Halifax County, Nova Scotia.

The birds that were thus destroyed included several thousands of Eiders, of Brunnich's Murres, and of Dovekies; hundreds or a few thousands of Mergansers, of Old-squaws, of Golden-eyes, of Black Guillemots, and of Razor-billed Auks; and at least a few American Scoters, White-winged Scoters, Scaups, Herring Gulls, and Great Black-backed Gulls. Although many Black Ducks winter in areas affected, this species appears to have suffered very little from the oil, for only one Black Duck certainly identified was reported as having been found dead as a result of contact with it.

Whether the Eiders that died as a result of these oil pollutions were *Somateria mollissima borealis* or *S. m. dresseri* is not known. It is of interest in this connection, however, that along the north shore of the Gulf of St. Lawrence, where *dresseri* is the common breeding race, reports from officers of the Canadian Department of Mines and Resources indicate that in the summer of 1942 there was no apparent diminution of the population of nesting Eiders and these birds enjoyed a very successful season of reproduction.—Harrison F. Lewis.

Resolution.—"In times of stress, such as the present, there is danger that public resources of permanent value may be exploited unduly to furnish food and other materials.

Be it resolved, therefore, that the American Society of Mammalogists at its 24th annual meting, April 3, 1942, goes on record as opposing the use of any such materials from National Parks, National Monuments, or National and State Wildlife Refuges, unless it be demonstrated that such materials cannot be obtained elsewhere." (*Jour. Mammalogy*, 23: 227, 1942.)

Drought

Now that the intense drought of recent years has been broken, it is easy to look upon it as no more than an interlude, no matter how unpleasant. The rains have come, the drought is broken, life can go on again after the same old pattern. But can it? Tons of topsoil, the slow reserve of centuries, are gone, blown away. It can be built again, but no man now living will sift it through his fingers. Still, the land is green again—Not the same land, and not the same green. Here are figures, as of the summer of 1941: "Square-foot samples of surface soil were collected from 49 drought-damaged ranges and prairies in Nebraska, Kansas, and Colorado, and viable seeds germinated. Seedlings grew at the average rate of 67 per sample. Forty species of forbs occurred, of which more than 96 per cent were annual weeds. . . . There were 26 species of grass seedlings of which 20 per cent were ruderals. . . . Numbers and kinds of seedling grasses were determined in June in each of 25 square-foot areas in each range or prairie. Extensive soil sampling and study of numerous rainfall records showed that an almost continuous supply of moisture had been available to promote germination and establishment of seedlings. . . . Of 550 square feet of soil on which seedling grasses were counted, 37 per cent supported none. Seedling grasses were especially rare in drought-stricken and dust-covered ranges of western Kansas. . . . Viable seeds of native perennial forage grasses, with rare exception, were present in such small numbers (26 per square foot) as to be of limited value, when seedling hazards are considered, in restoration of the vegetation. Average distribution of perennial grass seedlings on

the ranges and prairies was 4.3 per square foot; in mixed prairie alone, 2.4 per unit area. Even if all seedlings (exclusive of the stoloniferous buffalo grass) had survived and made a maximum growth in mixed prairie, they would have increased the cover less than 2 per cent." (J. E. Weaver and I. M. Mueller, "Role of seedlings in recovery of midwestern ranges from drought," *Ecology*, 23, 1942: 275–294.

The immediate effects of the drought were spectacularly severe; the after-effects may be less plain to the uninitiated but they may well be equally severe. They will persist over a vastly longer period of years.—F.N.H.

Reforesting Strip-mines

"The first year of operation of Indiana's law requiring the reforestation of areas from which coal has been removed by the stripping or open-cut method has resulted in the planting of approximately two million trees on 1,617 acres of such land. . . . Under provisions of the 1941 law, each company mining coal in Indiana by stripping off the soil overlaying the coal is required to reforest an area equal to that stripped. In addition the company must reforest an additional area equal to one per cent of the acreage stripped [in the past], a provision which eventually will complete the reforestation of older stripped sections." (*Outdoor Indiana*, 9, No. 6, 1942: 7.)

"Control" of the Golden Eagle in Texas

From Texas come officially sponsored news stories advocating control of Golden Eagles by use of the shotgun from airplanes. An official kill of 1,338 eagles since 1930 is reported.

The control of eagles at particular spots where new plantings of antelope have been made, or where some remnant of mountain sheep is slipping, might well be a practical necessity for a temporary period. To urge the flying public to pursue and shoot eagles is quite another matter, and might readily extirpate the species from the western ranges. Texas has been doing admirable work in wildlife conservation, but this eagle campaign seems quite out of harmony with the solid, tolerant common sense characteristic of other undertakings of the Texas Commission.—Aldo Leopold.

Wildlife Conservation Committee
Frederick N. Hamerstrom, Jr., Chairman

ORNITHOLOGICAL LITERATURE [1]

CATALOGUE OF BIRDS OF THE AMERICAS AND THE ADJACENT ISLANDS. By Charles E. Hellmayr and Boardman Conover. Field Museum of Natural History, Zool. Series, 13, part 1, number 1: vi + 636 pp. April 30, 1942. $5.09 postpaid.

After some unavoidable delay this keenly anticipated volume of the "Catalogue" by Hellmayr and Conover has appeared, and that it fully lives up to the standard set by previous parts goes without saying. The matter contained deals with the Orders Rheiformes, Tinamiformes, Galliformes, Gruiformes, and Columbiformes. The sequence of families and genera within these Orders follows that of Peters' "Birds of the World," though the grouping of the Orders themselves necessarily throws them, and the Orders to follow in future volumes, out of the Peters sequence. Presumably, this departure is to take full advantage of Mr. Conover's extensive knowledge of certain groups: in any event the arrangement will cause no inconvenience of moment to the public for whom the work is intended. The species and subspecies arrangement within the families adheres in the main to that of Peters, but some variation is to be noted here and there. One new name is proposed: *Penelope dabbenei* to replace *Penelope nigrifrons* Dabbene (not of Lesson, 1831).

In spite of the dual authorship, the method of treatment remains the same as in preceding volumes. The bibliographic references are invaluable and the commentaries which occur as footnotes on almost every page constitute at times almost a systematic review of a genus or species, although this the authors modestly deny in their preface. As in previous volumes, too, there is emphasis (it will be called over-emphasis in some quarters) on the use of trinomials for forms which are believed to be representative, whether or not intergradation has been shown. The application of this principle is too controversial a subject to be discussed in a short review. Individual systematists will, as always, follow their own beliefs and certainly none can quarrel with Hellmayr and Conover for so consistently following theirs.

So far as the territory covered by the American Ornithologists' Union "Check-list" is concerned, there seems to be only one basic name change. Transfer of the old, familiar name of the White-faced Glossy Ibis to the Limpkins (p. 301) is to be regretted but there is no alternative under existing rules. The races of the Rock Ptarmigan, *nelsoni, kellogae,* and *dixoni* are united (p. 205) under the single name of *americanus* Audubon. However, this and a number of other items relative to the inclusion or rejection of proposed subspecies, and of the reduction to subspecific status of forms now carried as species, are matters which will doubtless receive due consideration from the Committee on Classification and Nomenclature in preparing the next edition of the "Check-list."

Typographically, the work is a product of the Field Museum Press, a fact which makes further comment in this respect superfluous.—A. J. van Rossem.

LIFE HISTORIES OF NORTH AMERICAN FLYCATCHERS, LARKS, SWALLOWS, AND THEIR ALLIES. ORDER PASSERIFORMES. By Arthur Cleveland Bent. United States National Museum Bulletin 179, 1942. xi + 555 pp., 70 plates. $1.00. Supt. of Documents, Washington, D.C.

Persons already familiar with the Bent Life Histories require no reminder of the appearance of new volumes, but newcomers to bird study need to learn of them early if they are to get copies. The accelerated rate of issue of recent numbers brings reassurance that we may soon have the completed series. Already this is becoming the most widely sought work on American birds.

Accommodation to an expanding field of study is shown in part by the tendency to use more help in the preparation. Mr. Bent recognizes that accounts written

[1] For additional reviews see pages 161, 182, and 210.

by a person thoroughly familiar with the species may be more satisfactory than ones prepared chiefly with compiled material. Since his own experience was not sufficient for every species, he has solicited at least thirteen accounts for this volume, and these adhere closely to the arrangement of material adopted for this volume. Especially notable for its thoroughness and originality is the chapter on the Prairie Horned Lark by Gayle Pickwell.

Source materials for this work have been modified greatly by discoveries and changes in mode of study, which came soon after the start of its preparation. Retention of the original plan and objectives, however, has made the life histories more valuable than if they had been changed to meet the demands of some recent fad.

A reader is not likely to be equally interested in all the accounts. For example, the reviewer found that of the 47 species treated he was unfamiliar with 18, slightly familiar with 6, familiar with 17, and had conducted prolonged studies of 6. He turned first to the last group of life histories, and he has not yet read any of the first group!

The task of finding and sorting information has become too great to expect all the important items to be included for any species. Even though the assembly has been done remarkably well, we wonder sometimes what basis has been used for acceptance or rejection of material, especially in the distributional section. Published records, in some instances, extend the areas or seasons given. Some records cited, which are marginal, would carry reassurance if accompanied by some reference to the authority or place of publication. This applies especially to the flycatchers. A suspicion that the nest shown at the top of plate seven was not that of the Cassin Kingbird was verified when Mrs. Grinnell learned from the photographer that the locality was Wild Horse Mountain, about five miles west of Clear Lake, Modoc County, in the northeast corner of California, and that he took the parent bird to be an Arkansas Kingbird.

It seems obvious that insufficient basis is available to justify writing a history for each geographic race of the passerine birds. Modification of the plan so as to treat full species as units would condense the books and make them of considerably greater usefulness. The features of behavior treated rarely are known well enough to permit adequate treatment for separate races. The user of the work might be grateful also if the accounts of distribution were simplified. He will consider the volume not as an index to all facts concerning flycatchers, larks, and swallows, but as a valuable abstract of the hidden published knowledge of those birds.—Jean M. Linsdale.

Nesting Birds and the Vegetation Substrate. By William J. Beecher. Chicago Ornithological Society. 1942: 6 x 9 in., 1–69 pp., 1 pl., 10 figs. $1.00 at Field Museum Book Shop.

The quality of the groundwork for part, at least, of this paper is indicated by the number of nests found on the 482 acre study area: about 500 in 1935, about 700 in 1936; in 1937, the one year on which the paper is based, 1332 nests are tabulated, although the text (pp. 1 and 2) says "more than twelve hundred determined to exist" of which "over 85 per cent . . . were actually found". The description of plant succession, both geologic and modern, on the area is interestingly and thoroughly done; the account of the present plant communities and their general relations to nesting is good, barring a few questionable interpretations stated baldly as fact. There follows a section in which for each nesting bird is listed the total number of nests, the number in each cover type and the number of acres of that type, the calculated number of nests per hundred acres, and the number of acres (all cover types together) per nest.

The value of this section is reduced by a "correction" of the acreage of some of the cover types, a correction which works in one direction only. That is, about 45 per cent of two marsh communities was considered to be "unavailable to ground nesting birds," hence omitted from the total acreage, because of unusually

high water, while a neighboring area which "proved unusually attractive" for nesting that year was included at face value (p. 15). "Likewise, because most of it occurred in strips along roads or railway embankments and was clearly unused by birds for other reasons" (p. 28)—whatever that means—about 51 per cent of the prairie disclimax was thrown out. The same half-logic shows up in the nest density figures. Acres-per-nest was worked out to two decimals, even in the case of single nests, giving the appearance of extreme precision; yet the nesting density of the Prothonotary Warbler was calculated by dividing the number of nests into the total acreage of "Modified Woodland" (mainly "of the oak-hickory type" (p. 24)), of which only a part fronts on water.

A further refinement of the basic data follows in the addition of a numerical value "feet of edge per acre," determined by dividing the total boundary of all the scattered blocks of a particular community by the total acreage of that community; a table was made to show, for each plant community, the actual acreage, the "available" (i.e., "corrected") acreage, the number of feet of edge per acre, and the number of nests of each species, distinguishing between first nests and later or dummy nests.

In analyzing his data, Beecher limited himself almost entirely to the single aspect of nesting cover, the "vegetation substrate" of the title. His main points are two—an attempt to measure more exactly the importance of edge, or mixture of cover types, and to show the relation between inherited nest patterns and plant life-forms as the determining factor in nest distribution—neither of which could be proved by one year's study on a single small area, particularly when that year was one in which "the water table in May stood six inches higher than normal" (p. 15).

To measure edge effect quantitatively, Beecher converted the number of feet of edge per acre (using the "corrected" figures) to feet of edge per 100 acres, for comparison with the calculated number of nests per 100 acres. A scatter-plot based on these figures is said to show a definite, positive correlation between feet-of-edge and nest-density, but since at least two other variables (different kinds of cover, different kinds of birds) are also involved, the conclusion seems too strongly stated. Attempting to measure even more closely, he took a 38 acre sample (mostly marsh) and didived it into quarter acre quadrats, in each of which he counted both the number of plant communities and the number of nests; analysis of these data gave a more precise and quantitative expression of the original conclusion. Unfortunately—and one has to turn back 25 pages to find this—the sample plot contains a large amount of the "unavailable" cover thrown out earlier, as well as the 11 acres that were that year "unusually attractive" for nesting. This time, the "unavailable" acres are counted in.

Beecher's discussion of his second major thesis is stimulating but inexcusably one-sided. Thus, those species which nest earliest do so "because they are notably independent of vegetation of the year" (p. 48): there is no mention, much less disproof, of the possibility that they may seem independent because physiologically they must nest early and must take their nesting cover as they find it. Again, a half-page or so develops the theory that the Prairie Marsh Wren prefers to nest in *Typha* and *Carex lacustris* because these plants are particularly suited to its nest-building habits; the fact that the Short-billed Marsh Wren, with a very similar nest, uses a different sort of cover is dismissed in a few lines, "its prime requirement being a drier situation" (p. 54)—debatable, at the least.

There are many other instances of careless thinking, and several of careless workmanship. One example of the latter: in the text-references to the bibliography I counted 20 mistakes, including references to four papers that were not listed at all.

There is material here for a fine paper on a local nesting study, and a beginning toward a much broader exploration of the factors which underly the selection of nesting cover. The one needs only a further analysis of data already in hand, but the other enjoins a great deal more of both digestion and assimilation. Their present mésalliance is not ready for serious consideration.—F. N. Hamerstrom, Jr.

SHORT PAPERS

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Figure 1. The male Cedar Waxwing (left) arrives at the nest and gives part of his load of food to the brooding female.

Figure 2. Both birds then feed the four-day old nestlings.

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A STUDY OF THE NESTING HABITS OF THE CEDAR WAXWING [1]

BY ROBERT B. LEA

THIS study of the Cedar Waxwing (*Bombycilla cedrorum*) was made in the vicinity of the University of Michigan Biological Station at Douglas Lake, Cheboygan County, Michigan, during the summer sessions of 1940 and 1941. Twenty-one nests were found on the Station grounds in an area 600 yards long and 200 yards wide. The activities at twelve nests were carefully recorded daily, and five of the twelve nests were observed closely from tower blinds placed four feet from the nests.

A summary of the data obtained from these observations is recorded in Table 1, a compilation of information on nest locations, materials, and nest cycle statistics.

This paper is based mainly on the data from Nests 2, 3, and 3a, supplemented by observations on the other nests and by a review of the literature on Waxwings. In addition to 74 hours of observation from blinds, considerable time was spent weighing young and watching activities from the ground.

I am deeply indebted to Olin Sewall Pettingill, Jr., and Theodora Nelson of the University of Michigan Biological Station for the valuable guidance they gave me during this study. And I gratefully acknowledge the helpful suggestions and advice of Mrs. Margaret M. Nice, F. N. Hamerstrom, Jr., and Josselyn Van Tyne in the preparation of the manuscript.

Cedar Waxwings do not ordinarily have a song, though Whittle (1928:82) reported a "distinctly musical and pleasing" song, with a varied warbling arrangement, given frequently by a pet female Cedar Waxwing which was in an indoor cage. The call of the Cedar Waxwing is normally a long drawn out high-pitched lisping and whining sound with little variation through the year. According to Maynard (1928:73) the vocal organs of the Cedar Waxwing are comparatively undeveloped.

The adult birds are relatively quiet during the nesting season. For a call of alarm they use a note louder and higher than their usual call; it is a "piercing danger note, and even that . . . sibilant in quality"

[1] Contribution from the University of Michigan Biological Station.

(Whittle 1928:82; Nice 1941:62). On rare occasions while attending the nest they utter a low rolling sound. The nestlings develop a sibilant lisp as a means of begging food, and after they have left the nest the feeding area becomes a bedlam of Waxwing lisps and whines.

The Cedar Waxwings that I studied did not establish either feeding or breeding territories. Throughout the nesting season I saw small flocks of Waxwings in the Biological Station area. Frequently I saw adult birds from several nests paying no attention to one another while feeding at the same time in the same pin cherry tree and visiting their respective nests at intervals with food for the young. I found families of Waxwings nesting within twenty feet of one another and showing complete toleration of one another's presence. Even when the nestlings were maturing, and moving about in the vicinity, neighboring Waxwings were unconcerned. Wandering individuals or groups of Waxwings which stopped in the nest tree did not seem to make a brooding female uneasy. And a Phoebe that perched within two feet of a nest for fully half a minute aroused no apparent concern in a female Waxwing sitting on the nest.

These findings merely support those of previous observers. A. A. Saunders (1911:323), for example, says that "the flocking habit often continues throughout the nesting period, the nests being placed, if not in actual colonies, at least in close proximity to each other, and the nesting birds often congregating in small flocks." Crouch (1936:6) reported that a pair of Waxwings did not chase away a Chickadee that ventured into their nest and picked around the eggs, though they did fly at a Catbird that approached within two feet of the nest, possibly recognizing the larger species as a natural enemy.

There is evidence, however, that Waxwings may maintain a small nesting territory. A pair under observation while building a nest drove off a Vireo, a Hermit Thrush, and another Cedar Waxwing; and later, with young in the nest, they were disturbed by the presence of a Goldfinch and "flew at it" (Post, 1916:177, 185).

During the courtship period paired Waxwings showed great affection for each other. I watched a pair who engaged in a rhythmic routine of bill-clicking and sidling back and forth on a limb on which they had already begun to build a nest. This is called a "courtship dance" by Silloway (1904:13), who writes: "Two Waxwings were sitting near each other on the lower branch of a fir, about twenty feet from the ground. They were evidently courting. He would sidle over to her, rub his breast against hers, rub his bill caressingly upon hers, and then sidle back to his former place. Then the other bird would go through a similar performance."

Although such courtship displays are usually discontinued with the laying of eggs and the increase in duties about the nest, an activity was observed at Nest 2 which might be considered as a continuance of court-

TABLE 1
RECORDS OF TWELVE CEDAR WAXWING NESTS

Nest No.	Date found	Location	Material	Eggs	Incubation period	Nestlings	Nestling period	Eggs	Young leaving nest	Per cent success
1	6/25/40	Hard Maple A: 3.65 meters B: 1.52 meters	Small sticks, rootlets	5 Waxwing 1 Cowbird	.....	0	.....	5	0	0
2	6/28/40	Hard Maple A: 4.16 meters B: 1.93 meters	String, sticks, grass, rootlets, feathers, leaves	5 Waxwing	(3) 11 days (1) 12 days	4	18 days	5	3	60
3	6/28/40	Red Maple A: 4.64 meters B: 4.11 meters	Grass, rootlets, rag, rope, string, bark, spruce and pine needles, burlap raveling	2 Waxwing 1 Cowbird	11 days	1	17 days	2	1	50
4	6/29/40	Red Oak A: 4.97 meters B: 2.59 meters	White-pine needles, bark sticks, grass	4 Waxwing	?	4	14 days	4	4	100
5	6/29/40	Red Oak A: 2.43 meters B: 2.89 meters		4 Waxwing	?	4	(2) 15 days (2) 17 days	4	4	100
6	7/5/40	Red Maple A: 3.04 meters B: 0 meters	Sticks, grass, pine needles, silky string, moss	4 Waxwing	.....	0	.....	4	0	0
7	6/29/40	Red Maple A: 3.27 meters B: 0 meters		4 Waxwing	.....	3	.....	4	0	0
8	7/17/40	Red Oak A: 2.94 meters B: 2.79 meters		3 Waxwing	.....	0	.....	3	0	0
9	7/19/40	White Birch A: 4.13 meters B: 2.43 meters		?	?	4	.....	?	4	?
10	7/18/40	Hard Maple A: 3.14 meters B: 2.38 meters	Rootlets, sticks, grass	4 Waxwing	12 days	4	15 days	4	4	100
3a	7/7/41	Hard Maple	Grass, paper, leaves, rootlets, sticks, string, plant fibers	5 Waxwing	(2) 11 days (2) 12 days (1) 13 days	5	(3) 14 days (2) 16 days	5	5	100
6a	7/13/41	White Pine A: 7.9 meters	Grass, stems, rootlets, pine needles, thread, paper, leaves, bark	4 Waxwing	12 days	4	.....	4	0	0

Explanation—"A" is the height from the ground; "B", the distance from the trunk of the tree. Numbers in parenthesis under "Incubation period" indicate the number of eggs; those under "Nestling period" the number of nestlings.

ship behavior. When the male finished feeding the female, who was sitting on the nest, the pair engaged in an affectionate routine of bill-clicking and food-passing. The female finally passed the last bit of food to the male; after some billing and mouth-tugging, he returned the morsel. This performance was repeated until the morsel was finally eaten by one of the birds. Lack (1940) has shown that courtship feeding is characteristic of many diverse kinds of birds.

The Cedar Waxwing is a notoriously late nester. The literature shows many records of Waxwings observed nesting late in September, and Herrick (1905:86) reports an instance of a Waxwing found sitting on unhatched eggs as late as mid-October. At the Station the earliest date of eggs of the two seasons was June 15 (inferred); the latest known nest was begun August 1. Though only three nests were found on the first day of their construction, I estimated from the records of 17 nests that the average date of beginning was July 3.

For its nesting area the Waxwing prefers open woodlands where the forest growth gives access to the berry bushes and trees whose fruit is necessary to the feeding of the young. Table 1 lists the locations of the nests and shows that the average height of the nests was 3.63 meters, with the highest nest located 7.9 meters, and the lowest nest 2.43 meters, above the ground.

The Cedar Waxwing's nest is bulky and of loose construction, cup-like in shape, and usually built at the fork of a branch. Its main structure is made up of grass, rootlets, small sticks, and string or paper; the lining, if one is present, usually consists of fine grass, pine needles, or moss. Waxwings use almost any kind of available material in nest building. One nest located near a wastebox was composed mainly of paper packing material, and a nest constructed near a grapevine was made largely of the bark of grape.

In the construction of Nests 3 and 10, male and female toiled equally. The laboring birds left the nest together to search for material and returned to the nest together to share in the building process. Both birds gathered material for Nest 6a, but the female did the greater part of the building. Many observers, like Roberts (1932:160), have found that the main task of nest building was performed by the female, while the male assisted in the collection of material.

Waxwing mates took turns in nest construction work. Alternately each bird stood in the middle of the nest and worked the material into it by stretching the head over the side. The bird thrust the stick or string into place with swift dexterity, and then tucked the material in tightly with choppy actions of the bill. Rocking sidewise, and turning about within the framework, the Waxwing gave the nest the shape of its body.

An interesting episode in the history of Nest 3 occurred when the adult birds selected a diving board mat as a possible source of nesting

material. But a great deal of effort—tugging, violent twisting, and flapping jerks—was required before the strands of burlap were wrested from the mat. Shredding the mat was a tedious job, yet the persistent workers managed to extract fibers as long as 30 inches.

Six days were required for the building of Nest 3 and for Nest 6a. Five days were spent in the construction of Nest 10. These three records of the time required for nest construction are in marked contrast to Herrick's record (1905:94): In two days a pair built a nest, and by six days had four eggs incubating. Ten days later three eggs hatched. This record probably concerns a pair that had lost their first nest very early in the cycle.

On the day following the completion of a nest, the first egg was laid, and an additional egg was usually laid on each succeeding morning until the clutch of four or five eggs was completed. Incubation usually began as soon as the clutch was complete. Table 1 shows that in Nests 2 and 3a, there was as much as two days difference in the time of hatching. Incubation apparently began before the clutch was completed.

Incubation and brooding were done entirely by the female, and the male fed his mate part of the time. The attention of the male during incubation was very irregular. Sometimes he brought food to the female every twenty minutes. At other times he stayed away from the nest over an hour. While feeding, the male could be distinguished from his mate by the heavier black markings on the chin, as mentioned by Crouch (1936:4). By marking one bird with paint William A. Gross (1929:181) found in the case of one nest that both parents were incubating. The impulse of the females to incubate became stronger as the incubation progressed. They left the nest at the slightest disturbance during the first four or five days, but during the last five days the female in Nest 3 remained until my hand almost touched her. Herrick (1935:60) noticed that there is "undoubtedly much individual variation with respect to the reputed timidity of the waxwing, particularly in the early stages of its reproductive cycle."

While resting on the nests the females busied themselves with preening, watching the blind, catching small insects which flew too close, and turning the eggs. They showed distress from the sun's heat by twitching their tails in rhythm with their heavy panting. When they were aware of my presence, they gaped with open mouths and raised crests toward the blind, as though expecting trouble. Their rising crests were always an index of their anxiety.

The average incubation period for 18 marked eggs was 11.7 days; the longest period was thirteen days, and the shortest eleven days. A. A. Saunders (1911:325) gives incubation periods of twelve days in two cases, but William A. Gross (1929:181), who also worked at Douglas Lake, found the incubation period to be fourteen days.

Upon hatching, the young Waxwings were naked and flesh-colored and little longer than the unhatched eggs. They were very weak and able to hold their heads up for only a few seconds at a time. The leg and foot movements were feeble. The young birds did not utter a sound. A few hours after the nestlings hatched, the skin was noticeably darker, and the subdermal feathers along the dorsal tract were evident as tiny blue pimples. A slight jarring of Nest 10 brought the young to attention for food. They were unsteady, and could only with great effort hold up their heads for a few moments as they begged for food.

The nestlings of two days were able to move on their toes but could not definitely grasp objects placed near their feet. They still held up their heads with difficulty even though their body weight was nearly double that of the first day. At this age, whenever the nest was shaded from the sun by my hand, the nestlings responded by reaching for food.

At four days the nestlings moved their wings only in feeble, indirect motions but were able to grasp with their feet. When placed on its back on a board a nestling was unable to right itself, although in the nest it used its ability for directive grasping at the side of the nest to turn itself over. The eye slits of the nestlings at four days were apparently ready to break open.

At the age of seven days the nestlings were able to right themselves from an inverted position on a flat board. The eyes on this day were almost fully opened. The nestlings were quite active and constantly reached about with their feet, as though trying to seize something. One nestling was able to hold aloft a small celluloid ruler which I placed in one foot; it was, however, still unable to support itself upon a perch.

At nine days the nestlings, placed in the blind, used their wings to advantage in crawling about the floor. Bird D showed a great display of strength by perching on my finger and made an important advance by uttering its first sound at this age. It was a lisp similar to the adult call.

After nine days the peace and quiet of the Waxwing nests was gone, with the restless young giving sibilant cries for food and receiving replies from their parents. Furthermore, there was great activity in the nests. The young Waxwings stretched their necks and widely-opened mouths upward as though engaging in a mock feeding exercise, and flapped their wings eagerly as if ready for a take-off. Sometimes the nestlings chewed against the sides of the nest during their preening and stretching. When twelve-day old young were weighed, they all showed great pugnacity by striking my fingers with their bills and lisping belligerently behind their bold, black masks. When I placed them on a limb they clung tightly and were able to pull themselves up to a sitting position when I hung them upside down.

When the young of Nest 2 were twelve days old I placed them on the nest branch several inches from the nest. The adult male, bringing

food at ten minute intervals, attempted to coax them back into the nest by lisping and making short flights from the branch to the nest. The young, heeding his coaxing, became confused in their attempts to descend the branch to the nest, so the parent had to feed them where they were.

Young Cedar Waxwings were very quiet except during feeding periods. Whitman (1919:295) has observed that "except when they may occasionally mistake a passing bird for one of their parents, the young remain discreetly silent while the old birds are away." When conscious of my observation the nestlings of twelve days and older "froze" in rigid positions.

This protective habit has frequently been observed in adults, and Cameron (1908:48) found that Cedar Waxwings "had an extraordinary characteristic, that of drawing themselves to their utmost height and standing perfectly rigid on a branch with closed eyes . . ." Concerning the "freezing" habit Roberts (1932:159-160) remarks that the striped young are thus rendered "more or less invisible" but that the solid-colored adults gain very little by it.

Preening, flapping wings, pecking at each other, and making short flights constituted the activity of the young on the last day before they left the nest.

Until the tenth and eleventh day of their nestling life, the young showed a progressive increase in weight. During the next six days there was a leveling off of the growth curve and then a slight decrease in weight. I raised in captivity one nestling from Nest 3. When it was a month old its body measurements closely approximated those of the adult male.

A mature male, trapped for banding while he was feeding young, weighed 27.9 gms., nearly five grams less than Bird D at the time it left Nest 2, even though the wing spread and body length of the mature bird were greater. According to J. Van Tyne, the weight of this adult bird is less than 38 of the 39 weighed Michigan Cedar Waxwings in the University of Michigan Museum of Zoology collection. Apparently this light weight is to be expected in adult birds feeding young. In male Song Sparrows feeding their young, Nice (1937:26) found a 9 per cent loss of their normal weight; in male Tree Sparrows feeding their young Heydweiller (1935:9) found a 20 per cent loss.

After leaving the nest the young climbed and fluttered about the nest tree, and finally took short flights to neighboring trees. It is my impression that the young remain in the vicinity of the nest for some weeks. I often observed the banded young of Nest 2 feeding in nearby pin cherry trees until they were at least one month old.

The average nestling period for 21 young was 15.5 days. The longest period was 18 days; some of the nestlings left the nest at the age of 14 days. In the case of fourteen-day old fledglings, those in Nest 4

were disturbed by my banding activity, but those in Nest 3a were not disturbed by either banding or weighing and left the nest with their sixteen-day old brothers. In three of the nests observed by A. A. Saunders (1911:327) the young had nestling periods of 14, 16, and 18 days.

The attendance and concern of the female reached a maximum on the last day of incubation and first day of nestling life. From then on her time spent on the nest decreased, while the male, who heretofore had been rather indifferent in his attention to the nest, showed a great burst of activity, and assumed the leading role as food-getter for the young.

Both adults were active in feeding the young. The female made more frequent trips for food, but the male carried greater quantities. When the nestlings were very young and required the attention of the female during the greater part of the day, the male obtained most of the food and brought it to the nest, where the female aided in the feeding activities. When the nestlings required less attention, the female spent more time obtaining food. The female of Nest 3a did a remarkable job in obtaining all of the food for five nestlings when the male failed to appear after the young were ten days old.

TABLE 2

Feeding Frequency of Five Nestlings in Nest 3a

	Nestlings 1–2 Days	Nestlings 4–5 Days	Nestlings 7–8 Days	Nestlings 11–12 Days
Food supplied by male (trips)...	18	15	25	
Food supplied by female (trips).	8	18	21	41
Total number of feedings.....	26	33	46	41
Average feedings per hour.....	2.1	2.7	3.8	3.4

Table 2 shows the number of feedings required by the five nestlings in Nest 3a at different ages; each figure represents the number of feedings for the thirteen hours between 4:15 A.M. and 5:15 P.M. Up to the time the nestlings were seven days old, each individual was fed at every feeding trip. Later, when the nestlings were older and taking whole berries, I estimated that the average number of young fed per feeding trip was at least 3.5 nestlings. The working day of the adult bird, that is, the period during which nestling-feeding took place, was a little more than fourteen hours. Each young bird was fed on the average from two to three times per hour, or from 28 to 42 times per day.

TABLE 3
ATTENTIVENESS OF FEMALE AT NEST 3A

	Nestlings 1–2 Days	Nestlings 4–5 Days	Nestlings 7–8 Days	Nestlings 11–12 Days
Total hours of attendance.....	10.96 hrs. 87%	6.46 hrs. 59%	4.91 hrs. 38%	2.93 hrs. 25%
Total hours of absence.....	1.56 hrs. 13%	4.46 hrs. 41%	8.05 hrs. 62%	9.08 hrs. 75%

Table 3 shows the attentiveness of the female at the nest in relation to the age of the nestlings. By attentiveness I mean the time spent at the nest, including feeding, as well as the time spent in actual brooding. This information on attentiveness is based on 48 hours of observation at Nest 3a, in four periods of 11 to 13 hours each, during the 1941 season. The table reveals particularly a progressive decrease in female attentiveness as the nestlings grow older. The attentiveness of the female on a given day became less as the heat of the day increased. The male was present irregularly, and only during the short feeding sessions; when the nestlings were eight days old, he was present at the nest 9 per cent of the time during an observation period of 13 hours.

At Nest 3a there was a gradual increase from 2.17 feedings per hour, at the nestling age of two days, to 3.65 feedings per hour at twelve days. As the nestlings increase in age, the frequency of feeding increases, and there are peaks of feeding both in the morning and early afternoon.

The two-day old nestlings in Nest 3a were sheltered without interruption by the female Cedar Waxwing during a severe rainstorm, which lasted an hour and a half. Meanwhile, the male twice succeeded in bringing food and feeding the young while the nest was tossed about by the high wind and rain. During the middle of a very hot day (maximum temperature 93° F.) the feedings ceased, but the female remained at the nest for an hour and forty minutes to shade the five-day old young from the sun. During this time the male did not attempt to bring food.

Generally when males brought food to the nests, they regurgitated indistinguishable masses of fruit and insect material and passed a share of it to the females, who swallowed it. Both sexes then proceeded to regurgitate and to put the food down the gaping mouths of the nestlings. Herrick (1905:92) writes about feeding: "It is all a matter of nervous reaction. The food is not simply placed in the mouth, but pressed well down into the sensitive throat, which promptly responds unless the gullet is already full. The old bird watches the result intently, and if the food is not taken at once it is passed from one to another until a throat with the proper reaction time is found."

At first all food was crushed; but small whole pin cherries were fed to four-day old young, and whole June berries and blueberries were fed

when the nestlings were seven or eight days old. Six June berries comprised the maximum load of food carried by the male.

It is noteworthy that the feeding frequency of the Cedar Waxwing was greatest, not when the young birds were making rapid strides in weight increase, but after the eleventh day, when the activity of the birds was rapidly increasing and the development of the contour feathers was progressing. The food consisted mainly of June berries, pin cherries, blueberries, and various insects and spiders. Of 93 feedings in which the food could be distinguished as it passed to the nestlings, 81 consisted of berries, so that we can assume that about 87 per cent of the food was vegetable matter.

Figure 3. The sanitation of the nest is carried out by both adult birds.

While I was trapping the adult birds of Nest 9 for purposes of banding, I caught three adults that were trying to feed the young Waxwings which were serving as bait in the spring-trap.

Sanitation of the nest was carried out by both adults, since defecation usually occurred after each feeding session. One instance was noted of the persistence of this instinct after the young had left the nest. The male at Nest 2 continued to take the fecal sacs from the twelve-day old

young even though the young were perched on a limb two feet from the nest. Just as if the young birds were in the nest, the parent watched carefully as they posed in a defecating position and swallowed the excrement as it appeared.

Since I found that the Waxwings at the Station made so late a start and since I find no contrary evidence from banded birds, I conclude that, in northern Michigan at least, Waxwings raise but one brood a season. Maynard (1928:76) believes that it is a single-brooded bird, whereas Crouch (1936:7) suggests that as many as three broods are probably raised each season.

The Cowbird parasitized two of the twelve nests. Nest 1 was abandoned for reasons unknown after it was parasitized. Nest 3 was parasitized after two Waxwing eggs had been laid, but on the following day I could not find the Cowbird egg in the vicinity of the nest; I assumed that the Waxwings had removed it. I placed another Cowbird egg in this nest, and it was incubated, though it failed to hatch. Friedmann (1929:234) says that the Waxwing is an uncommon victim of Cowbird parasitism because the Waxwing nesting season starts after the Cowbird laying season has passed its height.

Almost all the birds in the area were compatible with the Cedar Waxwings. The brooding female of Nest 2 paid little attention to the Purple Martins and Kingbirds, which very frequently called overhead, though she did occasionally raise her crest in alarm at their activities. The Red-eyed Vireo, Goldfinch, Least Flycatcher, and Robin were close and peaceable neighbors of the Cedar Waxwings at all of the nests, and at no time was any interspecific strife observed. But Eugene Castle, a student at the Station, saw a Sharp-shinned Hawk make an unsuccessful strike at a group of Cedar Waxwings as they dashed into some low brush in the area.

Of the twelve nests in which activities were recorded daily, seven completed the nesting cycle. There were 44 Waxwing eggs laid in eleven of these nests (data on Nest 9 incomplete), and 29 of them hatched. Twenty-eight young reached the age of five days, and 25 the age of ten. Twenty-one fledglings left these nests, that is, 47.7 per cent of the eggs laid produced fledglings.

Summary

Twenty-one nests were found in an area 600 yards long by 200 yards wide. The activities at twelve nests were recorded.

The nests were found in oak, maple, pine, and birch trees at an average distance of 3.63 meters from the ground and 2.06 meters from the trunk. The nest was a bulky cup-like structure of loose construction.

Six days each were required for building two nests; five days were required for building a third nest.

At two nests both birds shared the nest building activity equally. At a third nest the female was the chief builder.

The average incubation period for eighteen marked eggs was 11.7 days. The maximum period was thirteen days, the minimum eleven. The average clutch was 4.0 eggs.

The nestling stage averaged 15.5 days. The maximum period was eighteen days, and the minimum fourteen.

The female Waxwing did all the incubating and brooding.

As the nestling grew the feeding rate increased, the brooding time decreased, the duties of the male became more important, and the female spent less time at the nest.

The fledglings apparently remained in the vicinity of the nest until they were at least one month old.

Of the 44 eggs laid in eleven nests 47.7 per cent were successful in producing fledglings.

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Shearwaters. By R. M. Lockley. J. M. Dent & Sons, Ltd., London, 1942: 5¼ x 8¼ in., xii + 238 pp.; 31 photographs, 4 figs. and 4 maps. 15s. net. Distributed by William Salloch, 344 East 17th St., New York City. $4.00.

Some years ago on a remote island off the Welsh coast, R. M. Lockley turned from farming and shepherding to bird watching and writing. No one since Hudson has, I think, combined the latter activities so satisfactorily and so well. As a professional writer who must keep one eye on the public taste, Lockley exhibits none of the glittering superficiality of Peattie. He has Selous' love of truth and Howard's caution. Writing as easily as Burroughs or Hudson, he is sensitive to character in both birds and men. Still young, and unknown to most Americans, he is a man to watch and an author to read.

The present volume brings together the author's observations on the Manx Shearwater, hitherto scattered in English periodicals. The result is essentially a life-history study, set in a popular framework. Personal in its approach, it lacks the scientific trimmings of full references, graphs and clear summarization. Near the end there is a slight loss in continuity. For the most part, this is an intensive study based on but a few pairs of banded birds. Carried on with increasing penetration over a ten-year period, the observations yielded new and fundamental facts which help to explain the lives of other Procellariiforms—surely one of the more abundant and least known families of birds in the world. The two sexes are found to mate for life; they may relieve each other of incubation duties at periods as long as nine days, and during such intervals they may forage over 500 miles away.

Among the birds studied were Adam and Ada, Bill and Bess, Carol and Caroline. Each had its own personality, but the anthropomorphic twist is never overdone. Youngsters like Hoofti and Toofti lighten the pages. Homing experiments stir one's imagination. The end product is delightful reading and good ornithology.

Attention should be called to the distribution price in America. It is, to say the very least, discouraging.—J. J. Hickey.

INTERRELATIONS IN A NESTING GROUP OF FOUR SPECIES OF BIRDS

BY LAIDLAW WILLIAMS

THIS article concerns the interrelations among pairs of Western Flycatcher (*Empidonax difficilis*), Creeper (*Certhia familiaris*), Bewick's Wren (*Thryomanes bewicki*), and Oregon Junco (*Junco oreganus*) which nested in close proximity to each other in the village of Carmel, Monterey County, California, during the seasons of 1940 and 1941. Not more than one pair of each species was nesting in the area at one time.

As nest sites all the birds used man-made structures. These buildings, located on five contiguous city lots, consist of two one-car garages and an open shed attached to one of them, a small frame house, and a

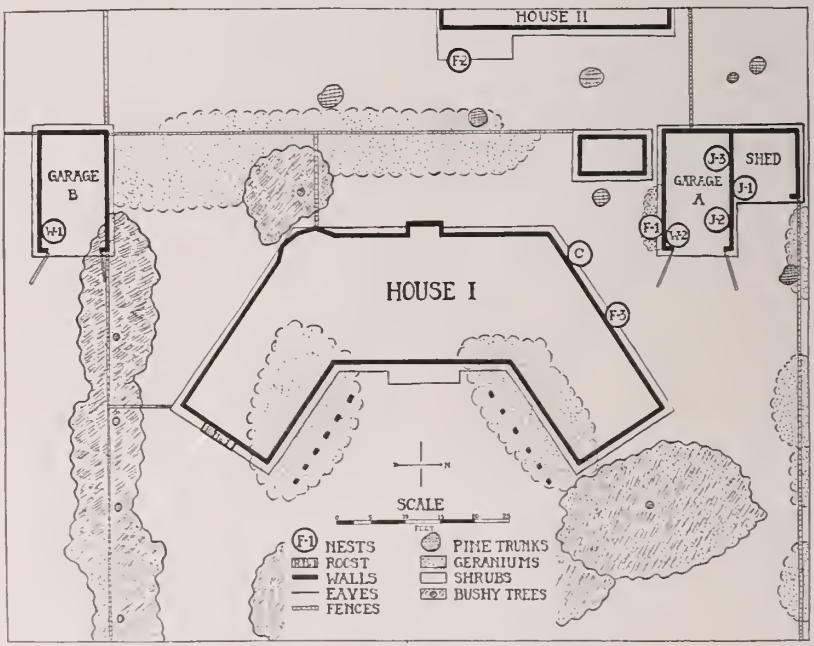

Figure 1. Plan of nest sites.

larger wooden house with walls covered by vertical slabs of redwood bark (Figures 1 and 2). A few Monterey pines, a live oak, a toyon, and a manzanita or two are almost the only relics of the original cover. Most of the native flora has been replaced by exotic trees and shrubs, the

dominant species being genista and acacias. Somewhat less altered conditions prevail on vacant lots nearby. The locality is within the Transition Zone of the humid Pacific Coast District.

Western Flycatcher

Season of 1940.—To make a nesting site for this species a four-inch board was nailed to the rafter ends, about seven feet above the ground, under the south eave of Garage A (Figures 1 and 2). Within a few weeks a pair of flycatchers built a nest (F–1) against a rafter at one end of the board (Figure 3); the young took flight from it on June 2.

Figure 2. Garage A. Nest F-1 was beneath the eave on the left; F-3 was around the corner of House I, on the extreme left. Bewick's Wren and Junco nested on opposite sides of the garage interior. The Creeper nest was on the same face of the house as F-3.

Eleven days later, on June 13, the same nest was being renovated by a flycatcher, presumably one of the same pair. Shredded redwood bark, stripped from the side of House I, was used to build up the sides of the nest, which had been slightly flattened by the first brood. On June 16 an egg was laid, and incubation of a set of three began on June 19. The young hatched on July 4, the fifteenth day of incubation. Five days later they were removed from the nest, presumably by a predator. Bent (1942: 249) remarks that the Western Flycatcher's "period of incubation is said to be 12 days."

Season of 1941.—On May 28 a Western Flycatcher nest (F–3) was found about nine feet above the ground on a horizontal slab of bark over a window of House I (Figure 1). This was probably the second seasonal nest of a pair which had recently fledged young from a nest (F–2) on the porch of House II, about 50 feet away. F–3 was 17½ feet from F–1. The three eggs laid in F–3 were removed on June 3, shortly after incubation had begun, probably by a California Jay *(Aphelocoma californica).*

On July 4 it was observed that nest F–1, which had remained more or less intact on the board beneath the protecting eave since its second use in the preceding season, was again being renovated by a flycatcher.

Figure 3. Western Flycatchers at nest (F-1) built on the end of a board beneath the eave of Garage A. May 29, 1940.

The sides of the nest were rebuilt, and it was used for a second brood as it had been in 1940. The possible renovation of nests of this species for a second brood is indicated by F. M. Bailey (1906), and by Grinnell and Linsdale (1936: 84). Repair and re-use of nests by this species in succeeding years is recorded by Gale (as quoted by Bent).

Creeper

Season of 1940.—On March 23 both members of a pair of Creepers were seen bringing pine needles into a crevice between slabs of redwood

bark on the northwest face of House I. This nest, designated as C, was 15½ feet from the flycatcher nest, F–1 (Figures 1 and 4). A slight widening of the crevice, used as an entrance, was 8¼ feet above the ground. Both parents brought food to the young, which left the nest on May 24.

Bewick's Wren

Season of 1941.—On March 11 a pair of wrens was observed building a nest (W-1) inside Garage B, 80 feet south of Garage A (Figure 2). The nest was placed on the roof plate about eight feet above the ground. The young left this nest on May 3.

Figure 4. Adult Creeper leaving nest crevice (nest C) on the side of House I. May 18, 1940.

Another nest (W–2) containing six eggs, presumably the second set of the same pair, was found on the plate in Garage A on June 6. Five of the six eggs hatched by June 11, but only two of the young were finally fledged. They left the nest on June 28. I do not know what became of the sixth egg nor the other three young. It was noted that spiders were sometimes included in the diet offered by one, or both, of the parents (Figure 5).

Oregon Junco

Season of 1940.—On June 1 a nest (J-1) of this species was being built on a shelf in the open lean-to shed at the north side of Garage A (Figure 1). On June 5 the first of a set of three eggs was laid. On June 19, after two eggs had hatched, the nest was found destroyed, probably by a cat.

Season of 1941.—On June 10 a female junco was seen carrying nesting material into Garage A, where the wrens had nest W–2 which then held six eggs. Large masses of dry grass were brought in on June 11. On June 16 a nest (J–2), containing two eggs to which a third was later added, was found 10½ feet away from Nest W-2 on the roof plate on

Figure 5. Bewick's Wren on the door of Garage A, carrying a spider to feed its young in the nest within the garage. June 15, 1941.

the opposite side of the garage. (A nest of the Carolina Junco [*Junco hyemalis carolinensis*] was found by Sprunt [1930] "placed on the rafter of a garage.") Two young hatched on June 29; they were missing on July 4, probably removed by a jay.

Another nest, J-3, was being constructed on July 8, supposedly by the same pair of juncos. It was on the same plate as J-2 but 7¾ feet farther back in the garage. The first of a set of three eggs was found in it on July 12. The last young hatched between 7 P.M. on July 25 and 5:45 P.M. on July 26. On August 6, at 12:10 P.M., as I was inspecting this nest, I flushed one of two young from it (the third young bird had disappeared some days previously in an unknown manner). The second

bird left the nest, apparently of its own accord, about 15 minutes later. Thus the two young were fledged in not more than 13 days.

Flycatcher: Creeper

On May 24, 1940, when the young flycatchers in F-1 were one week old, the fledgling creepers left nest C. As they took their initial flights they passed close by and lit near F–1; they were attacked in swooping flights by a parent flycatcher, so that one young creeper fell into a thick tangled clump of geraniums beneath the flycatcher nest.

Flycatcher: Junco

On May 30, 1940, antagonism was noted between one of this same flycatcher pair and a junco, probably one of the pair that built J–1. The birds were seen to fight and then fall together into the geraniums. On June 2 the flycatcher swooped and "chattered" at the female junco as she flew from the still empty J-1.

Flycatcher: Wren

On the evening of June 22, 1941, when the young wrens were still in W–2, the male wren was found roosting in the flycatcher nest, F–3, which had been deserted some time previously*. On the night of June 23 the male again roosted in F–3, and the female was found sleeping on the edge of her own nest, not down in the cup—apparently the young entirely filled the cup of W-2. On June 25 the male wren returned to an old roost (Roost No. 1) between redwood slabs on the side of House I (Williams, 1941: 277). The female, however, roosted in another flycatcher nest, F–1, which was just outside the garage wall from her own nest. This nest had remained *in situ* since its last use by the flycatchers in 1940. The female wren continued to roost there on succeeding nights. On the night of June 30, two days after her young had left the nest, she came to F–1 at the usual roosting time with her mate and two young. One of the young clambered onto the nest with her, but presently left, and the female roosted there alone. The male and one of the young roosted in separate chinks at Roost No. 1.

The female's roosting in F–1 continued undisturbed until July 4 when a Western Flycatcher began working fresh material into the sides of the nest. On that evening, as the wren worked her way to the eave directly above the nest, the flycatcher darted at her from a nearby perch, snapping its bill. The wren retaliated by posturing: tail cocked and spread, wings dropped, head held low. Twice again the flycatcher flew at the wren. At one of these encounters the wren fell or flew down out of sight in the geraniums under the nest. About ten minutes later

* In the sleeping posture in the nest the lower back and rump feathers were ruffed out, revealing their subterminal white spots. This ruffing out may be said to be typical of roosting Bewick's Wrens (Williams, 1941). However, in this case, the bird was lying horizontally with tail pointing diagonally upward, whereas the roosting wrens referred to in my 1941 paper generally perched upright with the tail drooping.

the whole wren family, both adults and two young, appeared near F–1. The female wren went to the nest. Twice the flycatcher hovered and snapped its bill in front of the wren on the nest, but the wren remained. The flycatcher flew at one of the young wrens, apparently pecking it, to judge from the ensuing squeal. The flycatcher also drove off the male wren as he approached F–3, 17½ feet from F–1. None the less the female wren was later found roosting in F–1 and persisted in roosting there each night until July 10. The flycatcher laid the first of a set of three eggs in F–1 on July 8. That evening the wren looked down into the nest twice as she settled down to roost. The next night she roosted on two flycatcher eggs, lying well down in the cup of the nest, as the male had at F-3. From outward appearances the wren might have been incubating the flycatcher eggs!

But on the evening of July 10 the flycatcher itself had already started incubation and was on the nest when the wren arrived for roosting. As the wren flew from the eave toward the nest the flycatcher darted off, snapping its bill, and seemed to make contact with the wren, since they both fluttered down into the geraniums together. After the flycatcher had extricated itself it remained nearby and, when the wren crept out of the thicket, attacked again. But almost immediately the wren approached the nest once more, lighting on the side of the garage near it, whereupon the flycatcher attacked, forcing the wren off and, with much loud snapping of bills, they fluttered down into the geraniums again. A squeal was heard, apparently uttered by the wren. Soon the wren moved off, and the flycatcher returned to incubation. I never saw the wren roosting there again.

All three flycatcher eggs hatched, the last between 1 P.M. and 7 P.M. on July 25, making the incubation 15 days, counting from the laying of the last egg until all were hatched. Because the duration of this period corresponds with that of the second brood of 1940, it may be supposed that the sleeping of the female wren on first one, then two, eggs on successive nights in the laying period had no effect on their hatching time. No data was obtained as to whether the wren exposed her abdominal skin to the eggs, nor what the temperature of the eggs was as she slept on them. All three young were fledged and left the nest on August 10 before 11:52 A.M., thus taking their first flight in the sixteenth 24-hour period after the last of them had hatched. Bent (op. cit.) presents no data on the fledging period for this species.

Junco: Wren

The most persistent and aggressively hostile behavior among the birds of this neighborhood of assorted species was exhibited by the pair of juncos that built J–2 and J–3 inside Garage A across from W–2. On June 13, 1941, when five of the wren's eggs had hatched, but before the juncos had begun to lay, the juncos were seen flying at the wrens as

they attempted to bring food to their young. A junco succeeded by these actions in driving a wren away once during an hour of observation in the early afternoon and twice during two hours in the late afternoon. On succeeding days, until the young wrens left the nest, both adult wrens were chased by both juncos. But the wrens managed to bring food to their young in spite of this. After the female junco started incubation, the male did most of the driving, although the female drove upon occasion when she was off the eggs. On June 19, for instance, during an observation period from 11:58 A.M. to 12:41 P.M., the female junco drove a wren upon three occasions while the male drove a wren eight times. The female wren was quicker to return to the garage entrance and more direct in following her route to the young than her mate, who was easily put off by the movements of the juncos and more hesitant in going to the nest. The male wren, holding a load of food in his bill, was actually restrained from delivery for 39 minutes on one occasion, at the end of which period I was forced to leave, the food being still undelivered.

The exact extent of the juncos' territory was never ascertained but I saw them chase the wrens as far as 29 feet northeast and 36 feet east from the garage entrance. The wrens nearly always fled to shrubs and bushy trees. Driving seemed confined to the vicinity of the garage entrance, the only route to the nest used by either pair.

The juncos habitually swooped upon the wrens whenever the latter lit on the ridgepole, the eaves, or the open or closed garage doors (even when closed these doors left a crack at the top large enough for the birds to go through). No actual contact between the birds was ever seen; the wrens always flew away. However, while one wren was being driven from the garage entrance the mate would sometimes dart in from another direction with food for the young.

Retaliation against the juncos was noted only once. On June 28, 1941, the two surviving young wrens of W–2 took flight. When the second one left the nest it fluttered to the ground just outside the garage entrance. The female junco left the nest where she was incubating, flew down to the fledgling wren, and pecked at it. Contact was probably made, as wren feathers, some still partly in sheaths, were found later at the spot. The young wren immediately flew off. At the same moment the male parent wren flew to the ground and advanced close to the female junco. The wren approached the junco slowly, tail spread, wings quivering over the back, while he made a series of snapping sounds, suggestive of the bill-snapping of a flycatcher capturing an insect. The display lasted only a second or two and then both birds flew away.

Often while watching the activities of the two pairs, I noticed that the male junco, while his mate was incubating at the other side of the garage, came up and looked at the nestling wrens. On June 23, six

days before his own young hatched, he put his bill into the open mouth of a young wren. On June 24 and again on June 26 he had a food-like object in his bill before going to the wren nest; but on these occasions, because of the poor light, it was impossible to determine whether the young wrens were actually fed by the junco. On five occasions on June 27, however, I definitely observed the male junco putting food into the mouth of a nestling wren. Feedings by the junco were interspersed with those administered by the parent wrens. On June 28 the male junco was seen removing excreta from the wren nest.

Discussion

Belligerency of the Western Flycatcher toward other species in the vicinity of its nest has been recorded by Richardson (1908: 67), who observed a pair during the process of nest construction. While one bird worked on the nest the other "would place itself in an exposed position to ward off intruders. Evidently it classed all birds as intruders, for an innocent Dusky Warbler, which happened to alight in the tree, was instantly driven off, leaving behind a goodly number of feathers."

The role of "helpers" at the nest, in which another or even several other birds attach themselves to a pair and join in feeding the female and young, has been described briefly by several writers and at some length by Skutch (1935). None of the cases mentioned by the latter, however, involved birds of different species, and the exact status of the helpers was not known beyond the fact that they were most frequently immature birds. There are, however, at least five records in the literature of nesting birds feeding the young of another species in a nearby nest. Hales (1896) tells of a male Scarlet Tanager feeding Chipping Sparrows in their nest before his own young had hatched. Forbush (1929: 420) reports a male Bluebird which, "instead of attending to his own young in a nesting box some thirty feet from the wren-box," attacked the parent wrens and then started feeding the young wrens. A. A. Allen (1930: 224–226) describes the actions of a pair of Redstarts, whose young were being photographed on the hands of Dr. Allen's children. The male readily came and fed his young, but the female was restrained by fear and delivered her food instead to nestling Robins in a nest 25 feet away. Twombley (1934) published a note concerning a Song Sparrow pair with eggs of its own, which fed nestling American Robins, and were first attacked by the Robin parents and then tolerated; the male Song Sparrow continued to feed the young Robins after they had left the nest. Lonsdale (1935) writes of Blue Tits which built a nest inside a nesting box on top of which a pair of English Robins *(Erithacus r. melophilus)* had already built a nest. The Robins laid five eggs and the tits three. When the former eggs hatched, the tits covered their own eggs with feathers and fed the young Robins. At first there was a "bit of a fight but eventually the birds settled

down" and no further friction was noted. After the young Robins left the nest the tits laid another set of seven eggs over the original three and raised a brood.

All five of these cases refer to pairs nesting in close proximity. Three of them refer, as does my own record, to feeding done before the feeder's own young had hatched; the others (the Bluebird and Redstart) had young of their own. In two of these instances the male alone did the foster-feeding, while in the case of the Redstart it was the female. Two of the records describe antagonism exhibited by the true parents toward the foster parents (American and British Robins). The Bluebird, like my Oregon Junco, fed the young wrens even though it attacked the wren parents. Thaxter (1930) describes a "Sacramento spurred towhee" feeding young Sierra Juncos out of the nest and attacking and driving away a female towhee which "would appear on the scene and become interested in the family." But the exact status of the towhees was not given.

E. V. Miller (1941: 92) says that Bewick Wrens do not use posturing as an aid in the maintenance of territory, nor does he record any other instance of posturing by the species. Mrs. Nice (1941), however, records display posturing of *Thryomanes bewickii cryptus* (a male courting a female; a male guarding a nest box) during which wings and tail were spread. In the present study I saw both sexes display, each using a slightly different form.

Nine English Wrens (*Troglodytes t. troglodytes*) have been found roosting together in an old Song Thrush nest (Dunsheath and Doncaster, 1941) and a Mountain Chickadee (*Penthestes gambeli*) has been found roosting in a Robin nest (Bassett, 1923). No antagonism, nor the re-use of these nests by the original owners, was mentioned by these authors.

In the present study, encounters were recorded between the flycatcher and creeper, flycatcher and junco, flycatcher and wren, and junco and wren. In each case the first named was the aggressor. In spite of this interference, all these species had some degree of nesting success.

Further study of interspecific pugnacity might point the way toward a better understanding of much antagonistic behavior among birds. Certainly it would seem that such behavior could not have its origin in sexual rivalry, which has so often been pointed out as a *raison d'être* for territorial behavior. On the one hand, no instance of antagonism was noted by Tinbergen (1939: 13, 28) between Snow Buntings and three other species which live in Snow Bunting territories, except on rare occasions when females apparently mistook Lapland Longspurs for female Snow Buntings. On the other, Mrs. Nice (1937: 68) says that Song Sparrows drive sixteen other species from their territories. "Field Sparrows *(Spizella pusilla)* are driven off with special vigor;

nevertheless, two pairs used regularly to nest on Interpont in the midst of the Song Sparrows." Lack (1936) records pugnacity between pairs of two species of starlings in Tanganyika Territory. Had the aggressor been successful, he writes, no material gain would have been achieved since there was no competition for nesting holes, each of the two pairs nesting in its own cavity four feet from the other in the same dead limb. The *Onychognathus walleri* "were so aggressive that a pair of *Stilbopsar kenricki* were not able to bring material to their own hole." They were aggressive "as a result of the close proximity, not competition, of the *kenricki*. The *kenricki* persisted in building, and eventually toleration was established. The *kenricki* were never observed to retaliate against the *walleri*." The Bewick Wrens, also, were never seen to retaliate against their aggressors except in the two instances of display noted above, and although there was no ceasing of hostilities, the wrens completed their nesting cycle.

Summary

A small community of nesting pairs of four species, Western Flycatcher (*Empidonax difficilis*), Creeper (*Certhia familiaris*), Bewick's Wren (*Thryomanes bewickii*), and Oregon Junco (*Junco oreganus*), is described. All used man-made structures for nest sites.

The walls of a Western Flycatcher's nest were rebuilt for a second brood in the first season, and again rebuilt and used for one brood the following year.

There was antagonism between the nesting pairs, especially between the flycatcher and wren, and junco and wren.

Along with this, however, the male junco fed nestling wrens. Similar behavior in other species is discussed.

Antagonistic display by both male and female wren is recorded, and the circumstances detailed.

Both male and female wren roosted in flycatcher nests.

Other records of interspecific antagonism are discussed, and it is suggested that further study of such behavior might lead to greater understanding of the original causes of territorial behavior.

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Box 453, Carmel, California

Wildlife Portfolio of the Western Parks. By Joseph S. Dixon. U. S. Department of Interior. 1942: 8 x 10 in., 121 pp., 58 photos. $1.25 of Supt. of Documents, Washington, D. C.

This attractive book of wildlife photographs was published "as a standard for camera enthusiasts and for the enjoyment of others who simply like to look." The majority of the photographs are by Dixon, but some notable pictures have been contributed by Wendell Chapman, Frank R. Oastler, the Muries, and others. The first 38 photographs are of mammals, 18 others are of birds, and two are of reptiles. The pictures are curiously uneven in quality—a number are first-class, others very mediocre. The author's 35 years' field experience from Alaska to Mexico has in most cases enabled him to handle successfully the difficult task of providing an interesting and worthwhile text for each picture. Scientific names are lacking even in the introductory "List of Animals."—J. Van Tyne.

GENERAL NOTES

Cooper's Hawk Takes Crippled Coot.—On January 15, 1942, I was traveling through the Atchafalaya River Swamp in south-central Louisiana with Conservation Agents Levert Bird and Charles Olana. The purpose of the trip was to collect a few birds that occur in the interior of the southern swamps for the Cooperative Wildlife Research Unit at the Pennsylvania State College.

While we were crossing Lake Natchez in Iberville Parish, a flock of Coots (*Fulica americana*) flew past the boat, and I attempted to collect two of them. The first fell dead in the water not far away, and the second began to topple and fall, badly crippled. When the Coot was thirty or forty feet from the water and about fifty yards from the edge of the lake, a Cooper's Hawk (*Accipiter cooperi*) dashed from its perch in the cypress-tupelo swamp on the lake shore, seized the crippled Coot, and returned to the woods with its prey.

All this happened so quickly that we could not realize for a few seconds what had taken place. By that time, all that could be seen of the potential museum skin was an occasional feather floating down to the surface of the lake.—Russell T. Norris, *Preston Laboratory, Box 847, Butler, Pennsylvania.*

Purple Sandpiper in Indiana.—At about 9 A.M. on December 13, 1941, while unsuccessfully hunting ducks on Lake Wawasee, near Syracuse, Indiana, I saw a Purple Sandpiper (*Arquatella maritima*). No glasses were available, but I observed the bird at my leisure at a distance of about 20 feet. The characteristics observed at the time include: a dark sandpiper with body about as large as a Killdeer, but with shorter tail; bill of moderate length, straight or very slightly decurved; light eye-ring; dark breast and flanks, but light belly; and a definite slate-blue cast to the feathers of the back. In flight, the dark central tail-feathers contrasting with lighter ones on the sides, the dark rump, and the light bar across the wings, were noticed. A sharp drop in temperature during the preceding night had covered most of the shoreward parts of the lake with ice, and frozen the adjacent beaches. But east from Vawter's Park to the point, on the south shore of the lake, there were several hundred feet of open water near shore, and it was on the adjacent beach that the bird was feeding. Though a new bird to me, there seems no doubt of the identification, which I checked a few hours later with Peterson's "Field Guide." It may be observed that almost *any* sandpiper, at that time of year, would be a noteworthy find. According to Mr. Palmer D. Skaar of Indianapolis, this is the first record of the Purple Sandpiper for Indiana.—W. E. Ricker, *Department of Zoology, Indiana University, Bloomington, Indiana.*

Flickers Dusting.—I have seen Flickers (*Colaptes auratus*) of both sexes take dust baths in the beds of flower gardens in suburban Baltimore. A female, already so engaged when first noticed, leaned forward on her breast with ruffled plumage and squirmed from side to side during the few moments more that her dusting lasted. A male squatted in a depression about a foot across and, with plumage expanded, dragged himself about on his belly, clearly by the use of his feet. Several times he dipped forward and dusted his breast, and he also rubbed both cheeks in the shallow dust. His bath lasted some seconds. The dates were, respectively, May 19, 1941, and August 1, 1942.—Hervey Brackbill, *3201 Carlisle Avenue, Baltimore, Maryland.*

Slow Recovery of Ohio Phoebes from the 1940 Storm.—During the early part of 1940 severe storms struck the southeastern states from Texas to Florida. At that time much was written concerning the loss of life of several species of birds but little was reported about the Eastern Phoebe (*Sayornis phoebe*).

In the Toledo area it became apparent in the following spring that Phoebes were greatly reduced in numbers. Whereas in 1939 as many as 20 individuals were seen on a four-hour trip during migration time, in 1940 the maximum was one. This condition continued throughout the breeding season; in fact, I saw but three Phoebes during the entire year.

Having heard much of the rapid recovery made by birds after disasters, I watched this species closely. During 1941 and 1942, however, the increase was very slight, as the following tabulation indicates (the trips were made during the period when the species was present in the Toledo area):

Year	Phoebes seen	Trips made	Phoebes per field trip
1934	115	64	1.8
1935	114	63	1.8
1936	90	60	1.5
1937	87	59	1.5
1938	55	46	1.2
1939	57	48	1.2
1940	3	26	0.1
1941	7	30	0.2
1942	7	34	0.2

The gradual reduction in birds per trip from 1934 to 1939 is probably due to the fact that I became progressively more interested in water birds, and more trips were made to marshes and mud-flats in those years.

Breeding birds were reduced correspondingly. Normally an observer could expect to list a few nesting Phoebes on every field trip into suitable territory. My records show a maximum of six in the course of an afternoon's hike. During 1940 and 1941 I did not encounter a single breeding Phoebe. Inquiries made of other local observers resulted in the following compilation of supposedly nesting Phoebes in Lucas County: 1940 (6); 1941 (7); 1942 (7).

If this condition is widespread, this species must have suffered far greater storm losses than early reports indicated.—Louis W. Campbell, *4531 Walker Avenue, Toledo, Ohio.*

A Technique for Confining Nestling Crows in Food-Habit Studies.—The Crow (*Corvus brachyrhynchos brachyrhynchos*) and its relations to other animals and to agriculture constitute an important part of a farm-game research program in progress at the Rose Lake Wildlife Experiment Station in Clinton County, Michigan. To obtain specimens of the food brought to nestling Crows by the adults, the following technique was evolved.

A number of the Crow nests on the Experiment Station area were found in the spring, and four nests with young were selected for the study. When the nestlings were three to four weeks old they were removed from their nests and confined in cages made from nail kegs. The solid top and bottom of each keg were removed, and the keg sawn in two, crosswise, to make two cages. Each cage was covered on the top with 2-inch mesh chicken wire, and on the bottom with one-inch mesh fox netting. The larger mesh top permitted the confined birds to stick their heads through the openings, to be fed by the adults. The smaller mesh bottom seemed to afford the nestlings a comfortable perch, but did not hinder the food items and droppings from falling through to the ground. Each cage was wired to the base of a tree near the nest at a convenient height. I found that one of the cages less than three feet high was vulnerable to depredation. The birds in this cage were killed and pulled partly through the mesh bottom of the cage

by a mammal, evidently the skunk whose den was within 50 feet of the cage. When the young Crows were about two months old, or after they had been confined for four or five weeks, they became too large and active for their cages and were released. Even at five weeks the adults were still feeding the young regularly.

Pellets and food items were collected from a sheet of heavy wrapping paper spread on the ground beneath the cage. When it rained, the paper, as well as the pellets and food, became wet. This made collecting a little more messy, but did not seem to affect the material, which was thoroughly dried within a few days by exposure to two 500-watt bulbs in a wooden-frame oven. From the four cages 52 collections, totaling 3,225 grams of dried material, were gathered for examination.—Philip Baumgras, *Game Division, Michigan Department of Conservation, Lansing, Michigan.*

Swainson's Warbler in Webster County, West Virginia.—From June 13 to 20, 1942, the Brooks Bird Club held its annual field trip at Holly River State Park, Webster County, West Virginia. On the afternoon of the first day I identified there several singing Swainson's Warblers (*Limnothlypis swainsoni*), a species with which I had fortunately had several months' experience in Nicholas County. Subsequently Swainson's Warblers were observed by Mr. and Mrs. John Handlan, Russell West, Mr. and Mrs. Charles Conrad, Pete Chandler, Maxine Thacker, and other members of the club and were found at all suitable habitats visited in the park. This extends about 60 miles northward the known breeding range of the species in West Virginia.—William C. Legg, *Mount Lookout, West Virginia.*

Variable Nesting Habits of the Parula Warbler.—There seems to be a widespread belief among bird students that the breeding distribution of the Parula Warbler (*Compsothlypis americana*) depends strictly on the presence of *Usnea* or *Tillandsia* beard "mosses." R. T. Peterson, for example, in a recent paper (*Audubon Magazine,* 44, 1942: 25) states that "the Parula Warbler is an especially good illustration of association with a particular life form. The northern race is a bird of the cool coniferous forest biome or Canadian life zone. Its ecological niche is where the *Usnea* lichen, or bearded moss, hangs from the trees. The southern race of this bird is found in a totally different biome, the more humid parts of the warm Lower Austral zone. There it is dependent on the Spanish moss" (*Tillandsia*). Clumps of these "mosses" furnish pendant nest sites for the parula warbler.

At Washington, D. C., where neither *Usnea* nor *Tillandsia* is present, Robert S. Bray and I, during May, 1936, found two nests in bunches of dead leaves and debris caught, during a flood earlier that spring, in low branches of deciduous trees bordering the Potomac River. Arthur A. Allen, in June, 1942 (personal letter), examined a similar nest found by Mrs. York along the Chemung River near Elmira, New York; and Florence Merriam Bailey mentioned this type of nest site in her "Handbook of Birds of the Western United States."

A nest collected by Ned Hollister at the National Zoological Park in Washington, D. C., on July 28, 1921 (U.S.N.M. 36282), is composed almost entirely of heavy brown wrapping cord and a small quantity of wool. It is scantily lined with horsehairs and rootlets and, apparently, hung pensile with the opening at the top, vireo-fashion. According to the label, it was found 6 feet, 8 inches from the ground in a Norway spruce (*Picea abies*) on a lawn near buildings. W. Howard Ball in May, 1934, at Washington, D.C., observed a similarly suspended parula nest about 60 feet up, in one of the topmost branches of a sycamore (*Platanus occidentalis*). Its materials could not be determined.

According to E. H. Forbush (Birds of Massachusetts . . . etc., 3, 1929: 227), "Dr. Anne E. Perkins records that about three pairs come yearly to Collins, New

York, and nest in upland woods where no *Usnea* grows. In 1921, one pair was observed building a nest somewhat in the form of that of an oriole on the down hanging branch of a pine tree. The material used was largely skeletonized leaves and pine needles, but the nest was blown down before it was quite finished." Arthur A. Allen at Ithaca, New York, found and photographed (*Bird Lore*, 21, 1919) "a nest composed entirely of leaf skeletons." It was located "at the edge of a small lake, hung in the tip of a drooping hemlock branch about 25 feet above the water. There was no *Usnea* moss in the vicinity, but the substitute had been quite as skillfully used."

J. Warren Jacobs (*Gleanings*, No. 4, 1905: 9) describes two nests that he found at Blacksville, West Virginia, where *Usnea* was scarce. One was "well concealed among the twigs at the end of a drooping spruce branch, nine feet up. The composition was chiefly of fine grasses, with a slight mixture of *Usnea* moss, vegetable fiber and small bits of wool." A second, similarly placed, resembled the first, but "contained a goodly supply of hickory catkins and hair, as well as some fine rootlets in the lining."

Around Washington, Parula Warblers are found in summer in widely varying woodland habitats. Apparently, mature or partly-mature forests are preferred, but open woods composed of trees between 30 and 50 feet tall are often inhabited. Mature pine stands are rare here, but mixed woods and pure deciduous forests seem to be equally occupied. No preference is apparently given either flood plains, hillsides or ridges.

On three large mature and partly-mature woodland areas near the city, the parula population during late June, 1942, averaged about one singing male per 20 acres. My attempts to locate nests in these areas then were fruitless. All individuals observed appeared to be nesting in the crowns of rather isolated 80- to 130-foot forest trees. Two juvenile birds with tails about half grown were observed near the ground on June 28 as they were being fed by their parents, and Robert Bartl of Washington witnessed the feeding of an offspring by an adult male on June 27.—George A. Petrides, *National Park Service, Washington, D. C.*

Myrtle Warbler Feeding Young Cowbird.—On June 30, 1942, Ruth Gilreath and I watched a Myrtle Warbler (*Dendroica coronata*) feeding a young Cowbird (*Molothrus ater*) near Bryant's Bog, Douglas Lake, Cheboygan County, Michigan. The Cowbird was a full grown juvenile, well able to fly. No young Myrtle Warblers were observed in the vicinity.

Friedmann ("The Cowbirds—A Study in Social Parasitism," 1929: 242, 244) describes the Myrtle Warbler as a species very rarely imposed upon, probably because its breeding range overlaps that of the Cowbird in but few places. He gives two records: a nest in Ontario, July 17, 1914 (Harrington, *Oologist*, 32, 1915: 99), containing two eggs far advanced in incubation and one fresh egg of the Cowbird; a nest near Hessel, Mackinac County, Michigan, June 20, 1919 (Van Tyne, *Auk*, 41, 1924: 169), containing a Cowbird egg and a warbler egg.

Friedmann (*Wilson Bulletin*, 46, 1934: 36) later adds another record of a set of one egg of the warbler and 3 eggs of the Cowbird collected at Pittsfield, Maine, May 26, 1891, by C. H. Morrell.—Oscar M. Root, *Brooks School, North Andover, Massachusetts and University of Michigan Biological Station, Cheboygan, Michigan.*

Ornithological Writings of the Late Prof. Frank Smith.—Compiled with the aid of Dr. Harley J. Van Cleave and Miss Alice S. Johnson of the University of Illinois.

1904 An unusual flight of sparrow hawks in Michigan in 1904. *Bull. Mich. Ornith. Club.*, 5(4), December: 77–78.

1906 A plan for a co-operative study of bird migration. *School Science and Mathematics,* 6(3), March: 224–225.

1907 Advantages of migration records in connection with bird study in schools. *School Science and Mathematics,* 7(3), March: 221–224.

1908 A migration flight of purple martins in Michigan in the summer of 1905. *Wilson Bulletin,* 20: 41–43.

1911 Double-crested cormorants breeding in central Illinois. *Auk,* 28(1), Jan., 16–19.

1915 The relation of our shrubs and trees to our wild birds. *Ill. Arbor and Bird Days,* 1915: 7–17, illus.

1915 The value of birds to the gardener and fruit grower. *Trans. Ill. Hort. Soc.,* n.s., 48: 272–77.

1916 (See last title below)

1917 The correlation between the migratory flights of birds and certain accompanying meteorological conditions. *Wilson Bulletin,* 29(1), March: 32–35.

1918 Bird migration and the weather. [*Ill.*] *Audubon Bull.,* 1918, Spring and Summer issue: 15–17.

1918 A snowy owl in captivity. [*Ill.*] *Audubon Bull.,* Spring and Summer issue: 24–25.

1921 Illinois birds as travellers. *Ill. Arbor and Bird Days,* 1921: 21–29, 6 maps.

1922 Starling invaders arrive in Illinois. [*Ill.*] *Audubon Bull,* 1922, Spring issue: 16–17.

1922 The European starling in Illinois. *Trans. Ill. State Acad. Sci.* 15:185.

1925 Interesting results from bird-banding activities. *School Sci. and Math.,* 25(6): 569–573; also in *Trans. Ill. State Acad. Sci.,* 18: 107–112.

1930 Records of spring migration of birds at Urbana, Illinois, 1903–1922. *Bull. Ill. Nat. Hist. Survey,* 19: 105–117.

N. A. Wood, Frank Smith, and Frank C. Gates

1916 The summer birds of the Douglas Lake region, Cheboygan County, Michigan. *Univ. Mich. Mus. Zool. Occ. Papers* No. 27: 1–21.—W. L. McAtee, *Fish and Wildlife Service, Merchandise Mart, Chicago, Illinois.*

New or Uncommon Utah Bird Records.—In a study of bird specimens in the U. S. National Museum collected on some of the early expeditions in the West, I found that a considerable number of the birds taken in September and the early part of October during the Hayden Survey of 1870 were secured on the north rim of the Uinta Mountains, Utah, instead of in Wyoming as had generally been assumed. Among the birds taken are two that are new to the recorded avifauna of Utah. These are:

(1) Myrtle Warbler (*Dendroica coronata*).—U. S. N. M. 60974, collected by H. D. Schmidt, October 9, 1870, near the Green River, south of the mouth of Henrys Fork. It is quite probable that this species occurs occasionally in Utah, at least during migration, but has been confused with its close relative, the Audubon Warbler.

(2) Common Redpoll (*Acanthis l. linaria*).—U. S. N. M. 60970 and 60983, collected October 10, 1870, by H. D. Schmidt in the same locality. This species has been suspected for some time of being a winter visitor to northern Utah, but no additional specimens have been taken. Large flocks have been reported in Bear Lake and Cache valleys near the Idaho-Utah line during the winter, although no specimen or positive record was obtained from the Utah side of the line.

Other uncommon Utah records that have come to my attention are:

(1) Hybrid Flicker (*Colaptes cafer x Colaptes auratus*).—U. S. N. M. 61093, Green River, apparently near Utah-Wyoming boundary, October 13, 1870, Hayden and Schmidt.

(2) Northern Orange-crowned Warbler (*Vermivora c. celata*).—U. S. N. M. 60675, Green River, south of Henrys Fork, October 6, 1870, Hayden and Schmidt; U. S. N. M. 60698, north slope of the Uinta Mountains, September 16, 1870, Hayden and Schmidt; U. S. N. M. 58568, male, Parley's Park, August 16, 1869, Robert Ridgway; Clarence Cottam's No. 1143, male, Raft River Canyon, 7500-foot elevation, in a grove of birches and alders, September 18, 1941.

(3) Northern Yellow Warbler (*Dendroica a. amnicola*).—U. S. N. M. 61871, female, Provo, Utah, July 30, 1872, H. W. Henshaw. (Determination was made by J. W. Aldrich.)

(4) Grinnell's Water-thrush (*Seiurus n. notabilis*).—This bird is probably a regular migrant through Utah. In his field report to the U. S. Biological Survey, Norman D. Betts reported seeing one on May 20 and three on May 22, 1917, at Linwood near the Green River of northeastern Utah.

(5) Harris's Sparrow (*Zonotrichia querula*).—An immature male was found dead November 26, 1916, on Norman D. Betts' ranch house doorstep at Linwood in the northeast corner of the State.—Clarence Cottam, *Fish and Wildlife Service, Chicago, Illinois.*

A Pensile Nest of the Red-wing.—In a recent conversation with my friend, Malcolm W. Rix, of Schenectady, New York, hanging nests of the Red-wing (*Agelaius phoeniceus*) were discussed. Mr. Rix told me that he had found such a nest some years ago and expressed belief that the specimen still existed, perhaps in the attic of his house.

Under date of July 18, 1942, Mr. Rix wrote me that he had been unable to find the nest but enclosed the photograph reproduced herewith. The picture clearly shows the general external appearance of the nest to be much like that of *Icterus spurius* or *Icterus galbula*. It was found May 27, 1900, along Oneida Creek, near Oneida Lake, in Oneida County, New York. It contained four eggs typical of the

species and was at the end of a grape-covered willow branch, about three feet above water several feet deep. The photograph was made by the late Egbert Bagg, Sr., whose son, Egbert Bagg, Jr., was with Mr. Rix when the nest was found.

Mr. Rix informs me that the inside depth of the nest was only slightly greater than that of the general average of the species, and not comparable to that of a Baltimore Oriole's nest. The color of the nest was distinctly that of a Red-wing's, although the materials apparently were somewhat finer than usual.—George Miksch Sutton, *Cornell University, Ithaca, New York.*

Turkey Bluejoint in the Diet of Indigo Buntings.—Along the northeast shore of Lake Erie, turkey bluejoint (*Andropogon furcatus*) grows abundantly on sand dunes and rocky shores. When found near woody protective growth, the ripe grains of this plant are important in the diet of migrating Indigo Buntings (*Passerina cyanea*). Observations were made at Point Abino in Welland County, Ontario, on the use of this grass by buntings. From August 20 until September 22, 1942, flocks of from 5 to 18 or 20 adult and immature birds were seen daily eating these grains. The birds perched just below the racemes on the two-meter culms, bending them half way to the ground, and then ate the grains on that culm or on an adjacent shorter one. The grains had not yet fallen at this time, and I did not see the buntings feeding on the ground or using any other plant for food. At 9 A. M. on September 17, seventeen buntings were feeding in this manner within an area of about one acre; some were perched in nearby willows in company with Song Sparrows and Chipping Sparrows. However, I did not see these sparrows feeding on bluejoint. When I left Point Abino on September 22, buntings were present in about the same numbers as during the previous few weeks, and bluejoint still formed the major part of their diet.—E. W. Jameson, Jr., *216 Delaware Avenue, Ithaca, New York.*

Additional Notes on Atlantic Coast Sharp-tailed Sparrows.—In my article "The Sharp-tailed Sparrows of the Atlantic Coast," (*Wilson Bulletin,* 54, 1941:107-120) I stated that I did not find Sharp-tailed Sparrows south of Chincoteague Island, Virginia. Dr. Paul Bartsch of the United States National Museum, however, tells me of a nestling *Ammospiza caudacuta diversa* he took at Pea Island, North Carolina, on July 2, 1938. The specimen is now at the United States National Museum. I compared this bird with a nestling from Virginia, and the two are practically identical. Having no knowledge of this specimen at the time I wrote my paper, I believed that it was unlikely that Sharp-tails would be found south of Chincoteague Island. In the light of this evidence one must include North Carolina, as far as Pea Island, in the breeding range of the race. I visited Pea Island in July, 1941, for two days but failed to find traces of these birds. Dr. Bartsch also took a bird, now in his own collection, on Smith Island, Virginia. on July 4. Smith Island is not unlike Cobb and Rogue Islands, where in 1941 I found no evidence of Sharp-tails.

I am not surprised to discover these instances, since the birds are very erratic, and Pea Island offers the proper habitat for Sharp-tails although its neighboring island, Roanoke, does not.

I wish to correct the spelling of "Chebaque," which should read Chebogue, and of "Melassam," which should be Melanson (both on p. 108). These localities I copied directly from Victor Gould's labels, and the two maps I consulted did not list them. "Goss Island" (p. 107) should read Grosse Ile. I am indebted to Harrison F. Lewis for pointing out these errors.—William Montagna, *Department of Zoology, Cornell University, Ithaca, New York.*

To the Members of the Wilson Ornithological Club:

Many of you read the statement in the June *Bulletin* regarding the Club's need for additional income. A certain number of members responded, and a good start was made toward a substantial increase in the number of life memberships in the Club. Especially under present conditions, this modest beginning is encouraging. In the March *Bulletin* we shall give you a list of the new Life Members and tell you something about each of them.

At this time the Endowment Committee would like to inform you somewhat more fully on the requirements which must be satisfied if the Club is to fulfill in a satisfactory manner the role it undertakes and the obligations it assumes in the field of ornithology. And we wish to emphasize most strongly that only through your generous assistance, and that of the friends of the Club, can this very desirable end be attained.

Of the various activities of the Club, by far the most important is the publication and distribution of the *Wilson Bulletin,* for it is by means of the *Bulletin* that we make our major contribution to ornithology. Through its pages are presented the most recent observations and researches in the field; its book reviews and notes keep the membership up to date in this and in related fields; and it creates a sense of unity and of satisfaction in the work of the Club. Next to this in importance comes the holding of our annual meeting, and as you know, this event has come to be one of the outstanding meetings of its kind, both because of the uniform excellence of its programs and because of the quality and enthusiasm of its attendance. Still other activities are those of various committees, though in the main they carry on their work with little expenditure of Club funds.

Most of these activities are of an expanding nature, and so outgrow our ability at any time to carry them on to the fullest extent. For example, there is an urgent need for enlarging the *Bulletin* to permit timely publication of important papers that now must wait until space is available. More illustrations and an occasional color-plate would also be highly desirable. The work of scientific committees on worthy research projects should be greatly extended.

All these things call for additional income, and such additional income must be secured through an increase in endowment. The increase in endowment, in turn, will have to come from the following three sources:

Life Memberships: By the payment of one hundred dollars in one sum, or in four annual installments, one may become a Life Member, with exemption from further payment of dues. For those engaged professionally in the field of ornithology, or closely related fields, such payments are deductible from taxable income.

Outright Gifts: Those who wish to support the work of the Club are urged to make direct donations to the Endowment Fund. Such contributions can be ear-marked for specified purposes if desired, but it is preferable to leave the disposition of the income from such gifts to the discretion of the Club's officers and Council. Such gifts to a scientific organization are also deductible from taxable income.

Bequests: We suggest that consideration be given to the matter of contribution to the Endowment Fund through gifts of this nature. An attorney should be consulted on the most effective method of bequest.

The Committee urges your earnest consideration of these matters to the end that you contribute to the extent of your ability to the furtherance of the aims and purposes of the Club. You believe that the Club is doing a fine work in its field, and that it should be enabled to enlarge its contribution; you would like to see the Club maintain its excellent position and go on to further eminence. It is up to you—the Club needs your help!

Respectfully yours,
The Endowment Committee
George B. Thorp, *Chairman*

EDITORIAL

We would welcome a much larger number of contributions to the General Notes section of the *Bulletin*. These notes provide items of especial interest to a wide variety of readers and often contain, page for page, more contribution to ornithology than major articles. However, contrary to the first impressions of many intending contributors, a really good note requires careful thought and accurate writing. Usually several versions are necessary before even the most experienced writer attains an accurate, concise statement of all of the pertinent facts and the justifiable conclusions. As to subject matter, our readers are least interested in records of unusual seasonal or geographical occurrence; reports on habits and other life history matters are much preferred and commonly have more scientific value.

Many of our members are now in the Army, Navy, or Marine Corps, or are doing civilian war-work in regions strange to them. The revised membership list published in this issue will enable them to locate fellow Wilson Club members who live nearby and can direct them to the best places for bird study. In these strenuous times there are more frequent address changes than usual, but your Secretary and Editor will gladly furnish members with the latest such information on any region. On behalf of the British Ornithologists' Club, N. B. Kinnear of the British Museum of Natural History (Cromwell Road, London, S. W. 7) has generously offered similar help to any of our members stationed in that country.

We are indebted for editorial assistance during 1942 to W. J. Breckenridge, Pierce Brodkorb, Frederick M. Gaige, Helen T. Gaige, Grace Orton, Roger T. Peterson, George M. Sutton, Ruth D. Turner, Frank N. Wilson.

Ornithological News

The Sixtieth Annual Meeting of the American Ornithologists' Union was held at the Academy of Natural Sciences in Philadelphia, October 12 to 16, 1942. Officers elected for the new year were as follows: *President,* James L. Peters; *Vice Presidents,* George Willett, and Hoyes Lloyd; *Secretary,* Lawrence E. Hicks; *Treasurer,* J. Fletcher Street; *Editor,* John T. Zimmer. Arthur A. Allen, Rudolphe M. de Schauensee, Robert C. Murphy, and Rudyerd Boulton were elected new members of the Council; Clarence Cottam, Rudolphe M. de Schauensee, and Harrison F. Lewis were elected Fellows; Earle R. Greene, Harry W. Hann, Robert C. Miller, Earle L. Poole, and S. Dillon Ripley were elected new Members. The 1943 meeting, if conditions permit, will be held in New York City in October.

Claude H. B. Grant, editor of *The Ibis,* announces the election of David Lack to the new post of Biological Assistant Editor. With the year 1943, the grouping of annual volumes of *The Ibis* into six-volume series will be discontinued, and the one for that year will be designated as volume 85.

The 1942 Walker Prize in Natural History was awarded by the Boston Society of Natural History to Frank Bene of Springfield, New Jersey, for a paper on hummingbird behavior.

William W. Griffin recently resigned as editor of *The Oriole,* quarterly publication of the Georgia Ornithological Society, to join the Marines. In September he was commissioned second lieutenant. The new editor of *The Oriole* is Robert Norris of Tifton, Georgia.

Richard L. Weaver has been called to the University of New Hampshire at Durham as Extension Specialist in Conservation and Associate Professor of Biology.

William F. Rapp, Jr. (130 Washington Avenue, Chatham, N.J.) is making a study of the occurrence of the Swallow-tailed Kite in the northeastern states (Pennsylvania, Delaware, and northeastward). He requests information on all records and especially on the present location of specimens.

REPORT OF THE NOMINATING COMMITTEE

Your Committee offers the following nominations for officers of the Wilson Ornithological Club for 1943:

President: George Miksch Sutton
First Vice-President: S. Charles Kendeigh
Second Vice-President: Olin Sewall Pettingill, Jr.
Secretary: Maurice G. Brooks
Treasurer: Milton B. Trautman
Councillors: Burt L. Monroe, Eugene P. Odum, Lawrence H. Walkinshaw.

Since the usual Annual Meeting has been cancelled because of war conditions, balloting must be by mail. Therefore this committee report is being published in the December *Wilson Bulletin* and members are requested to mail their votes promptly to the Secretary. In addition to the slate offered above, all Active and Sustaining Members are eligible for office in the Club. Any such name may be written on members' ballots, if preferred, in place of names from your committee's slate.

Herbert L. Stoddard
Jesse M. Shaver
Margaret M. Nice, *Chairman*

To the Editor of The Wilson Bulletin:

Though the author-catalog of the "Bibliography of Birds" was published about three years ago (*Field Mus. Nat. Hist., Zool. Ser.,* 25, parts 1 and 2, 1939), there has been unavoidable delay in the publication of the third and much larger volume, which consists mainly of subject- and finding-indices. Galley proof for subjects as far as "migrations" in the subject index was received over a year ago, also 110 pages of page proof, which include subjects as far as "connective tissue." Occasional requests have been received for information contained in these indices, and I am sympathetic with these efforts.

The finding-index cannot be finally arranged until all of the page proof has been produced. However, all of the items have been written, and they have been sorted for those subjects covered by the page proof received. As a topic may occur in many parts of the subject-index, the finding-index is essential. It is, therefore, not feasible to attempt to locate at this time all of the references dealing with a topic. However, many can be located.

I cannot take the time necessary to search through the manuscript of the subject-index or through the many thousands of slips which bear the finding-index items. However, I am willing to employ and direct a student to do what is feasible in collecting references to topics which may interest correspondents. Such service can probably be obtained for 50 cents an hour, and it should ordinarily not take more than a few hours to do what is feasible on any single topic. This expense would be charged to the correspondent. Care would be taken to avoid impracticable searching. My memory of the location of items would of course help.

R. M. Strong
Loyola University School of Medicine
706 South Wolcott Avenue, Chicago, Ill.

WILDLIFE CONSERVATION

Effects of the War on Government Wildlife Conservation Agencies

Funds, manpower, equipment, materials, and transportation are essentials which enable wildlife conservation agencies to plan and carry on their various functions. To determine what effect the war is having on wildlife agencies, it is necessary to determine the status of these factors at this time.

Funds: Shortly after the United States became involved in war Congress reduced the appropriations of a number of Federal conservation agencies. The Pittman-Robertson appropriations were cut from the Budget Bureau figure of $2,225,000 to $1,250,000. The result will be fewer wildlife restoration projects, but the full effect will not be felt for another year, since many states have carry-overs from last year, and Pittman-Robertson grants are valid for two years.

Food habits work by the Fish and Wildlife Service has been discontinued because no funds were appropriated for it.

The Soil Conservation Service has had to curtail the work of its biology division because of reduced funds. A number of the biologists have been reclassified as farm-planners; their services are still available to wildlife, but on a much more limited scale than formerly.

The Civilian Conservation Corps received no funds, and liquidation of that agency is well under way. Most of the enrollees are either entering military service or are finding places in industry.

A change of agricultural policy from one of restricting the production of food supplies to one of producing to the utmost has resulted in a curtailment of funds to the Agricultural Adjustment Administration, which had indirectly contributed to wildlife restoration by encouraging the planting of grasses and other soil-saving crops.

It is still too early to report the effects of the war on the finances of State game departments. To date the sale of fishing licenses has been about normal; some states have showed increases, others decreases. Figures are not yet available on the sale of hunting licenses. Some states expect reduced receipts, but on the whole it is expected that the numbers of hunters to take the field this fall will be little less than in the previous year.

Manpower: A majority of the men in active wildlife work are of military age, and many have left and others will leave for military service. Replacements are increasingly difficult to make, for most of the eligible candidates—technically trained men, such as engineers, surveyors, agronomists, and persons familiar with map reading—are in great demand by the Army and Navy, and by defense industries. Semi-skilled and unskilled labor are both attracted by the high wages of industry and so are temporarily lost from wildlife restoration projects.

Michigan and West Virginia are examples of what is happening in all State departments. The Michigan Department of Conservation has already had over a hundred of its employes enter military service. Others have found employment in defense industries, where high wages prevail. West Virginia reports that it has had a one-third turnover in its game warden force, due to men leaving for military service and industrial employment.

Equipment and materials: These items are subject to priority ratings, and many of them are becoming difficult, if not impossible, to obtain for wildlife restoration. After the outbreak of war, the Fish and Wildlife Service adopted a policy of starting no new developments, except to replace a very few buildings which had been destroyed by fire and which were essential for the maintenance of existing facilities.

Dealers' stocks of wire fencing are almost exhausted, but there is a tendency, which will undoubtedly grow as the war progresses, to go back to various kinds of wooden fencing. The limiting factor here will be the labor to cut the timber and build the fences.

Scientific instruments, cameras, and all but the most inferior binoculars, are being channeled to the war agencies.

The manufacture of sporting ammunition ceased June 15, 1942, but the effects of this will not be felt for another year as there were adequate supplies of ammunition on hand for this season. Certain types of new guns can no longer be purchased.

Transportation: Along the Eastern Seaboard, conservation law-enforcement agencies have experienced little difficulty in procuring enough rubber and gasoline to carry on their regular duties. The activities of wildlife research men have been curtailed somewhat, but the immediate result has been beneficial as more intensive work on limited areas is being emphasized. In some western states a few Pittman-Robertson men are using horses for short-distance travel. In the East it is expected that sportsmen will save their gasoline for hunting trips, will "double up" on the use of cars, and will use common carriers wherever possible.

In spite of limitations on personnel- and material-resources, the wildlife profession is presented with one of the biggest opportunities it has ever had. In the past, wildlife has been valued primarily as a means of recreation and only secondarily as a product to be utilized. From now until the war is won wildlife must be considered primarily as a renewable resource to be used in helping to preserve the Nation. Actually, the utilization of wild animal products is as old as man.

It is conservatively estimated that 135 million pounds of wild meat and 300 million pounds of fish are harvested by sportsmen and fishermen each year. If this is used in place of domestically produced meat it will free an equivalent amount to be sent to our fighting forces and to our allies. The total supply of game as food can be increased by not wasting any of it and by not allowing so many cripples to escape to die and rot.

In certain places there exist surpluses of large and small game which have been problems to game administrators. It is possible to devise means of reducing these surpluses and using the animals for food. This will call for real wildlife management.

Rough fishes have been considered by many as akin to pollution, but they have been commonly used as food in foreign countries and by many people in this country. Tightened belts can assist us in changing some of our food habits so that many fish products which formerly went to waste will now be used as food.

Commercial interests along our seacoasts have struck a bonanza in shark liver for vitamins and shark fins for a soup which is esteemed by many. A concern in Missouri has begun the manufacture of poultry- and hog-feeds from rough fishes, and commercial deep sea fishermen are saving livers which they once threw away. Ohio is raising both game and food fishes in its hatchery ponds.

Furs are in greater demand than ever before, both for civilian and military purposes, and ways of increasing the production of certain fur animals have been worked out.

If the time comes when restoration projects have to be further reduced or even eliminated because of inability to obtain equipment, supplies, and manpower, greater emphasis could be placed on the purchase of lands to be developed after the war.

The wildlife profession now faces the double challenge of managing and utilizing this resource to help in winning the war and of planning for the period after the war. Within the past decade of wildlife management we have conducted many experiments and demonstrations. The time has come when management for the utmost production and use should be practiced.—William Johnston Howard.

Conservation Notes from Canada

A pronounced increase in the numbers of Hudsonian Curlew that appear in July and August as southbound transients in Saguenay County, Quebec, on the north shore of the Gulf of St. Lawrence, was reported from that region in 1942 by bird protection officers of the Department of Mines and Resources. Flocks

containing from 100 to 20 birds each were not uncommon, and smaller flocks were numerous. Losses that this species may suffer during its annual sojourn in South America are evidently not so great as to prevent an increase in its population when conditions are favorable for it in North America.

The Arctic Islands Native Game Preserve, in the northern part of the Northwest Territories of Canada, was substantially enlarged on August 4, 1942, by Order in Council of the Dominion Government. The area of land and fresh water included in this addition is 281,392 square miles, which brings the total area of this preserve to 720,497 square miles. The total number of Native Game Preserves in Canada's Northwest Territories is five, and their total area is now 865,389 square miles. The policy under which these preserves are administered provides for hunting and trapping by aborigines and half-breeds only, except that in a small number of cases white men's hunting and trapping rights that existed prior to establishment of a preserve are continued.—Harrison F. Lewis.

Plant Sanctuaries

"The convention [of the Michigan United Conservation Clubs] favored a request made by the Michigan Wildflower Association that it back a proposal to legalize establishment of plant sanctuaries in Michigan, similar in nature to the present hundreds of wildlife sanctuaries. Under the proposal, sanctuaries with a minimum of five acres could be established on action of the Conservation Commission. Hunting in such sanctuaries would not be banned." (*Michigan Conservation,* 11, No. 7, p. 6, July-Aug., 1942)

Minnesota Caribou

A "filler" in the December, 1942, issue of *The Conservation Volunteer* (official bulletin of the Minnesota Conservation Department) reports: "Minnesota's last caribou herd in the Red Lake Game Refuge has been helped considerably by the past few mild winters. Most recent information reveals [that] these animals are at least holding their own. Their numbers are estimated at 15-20, including this year's calf crop." (p. 16)

The rest of the story, however, is not "revealed" in the article. It is this: The Red Lake herd is the last one in the United States, barring a few animals that occasionally drift south from Canada in winter. Early in 1938, when the herd had dwindled to three females, the Federal Government undertook to save it by adding to it a number of animals bought from the Canadian Government. Ten (one of which later died) were live-trapped and shipped to Minnesota—an extremely difficult job. Still more time and effort were devoted to a close study of the augmented herd in order to learn what more needed to be done to ensure their safety. This second phase of the work was continued, under increasing difficulties, until the spring of 1942.

About half of the herd has been kept in a 3200 acre corral. Recently, according to earlier agreement, the project was turned over to the State. This autumn the corral was opened and the caribou released; this same autumn a large block of neighboring land, formerly refuge, was opened to deer hunting. The boundary of the new deer hunting area is no more than five miles from the point of release, and the liberated animals have lost their fear of man.

The implications of these recent developments reach beyond the boundaries of the State: conservationists the Nation over will hold the Minnesota Department of Conservation responsible if a single caribou is lost as a result of this blunder.—F.N.H.

Wildlife Conservation Committee
Frederick N. Hamerstrom, Jr., Chairman

ORNITHOLOGICAL LITERATURE [1]

BIRDS AROUND NEW YORK CITY. By Allan D. Cruickshank, American Museum of Natural History. 1942: 5½ x 8 in., xvii + 489 pp. End maps, and 36 photographs. $1:75.

The New York City region, which includes northern New Jersey, all of Long Island, and the southern part of New York State, is, with the possible exception of the Boston region, the most thoroughly worked area its size in North America. The records, made by hundreds of observers, and spanning a period of nearly a century, constitute a volume of material so great that this book is necessarily a synthesis rather than an analysis. If some of Cruickshank's discussions seem a little too generalized, it must be remembered that it is no longer possible to go into minute detail about a region where such a tremendous volume of data has accumulated. Even rarities eventually become commonplace. For example, when Ludlow Griscom wrote his *Birds of the New York City Region* in 1923 there were two records of the Little Gull; now there are 60! Whereas in 1923 there were three records for the Arkansas Kingbird on Long Island, there are now 63, with the number growing each year. There were but three definite records in the New York City area for the Ring-necked Duck; now there are *hundreds,* and the bird can be found on several ponds on any winter's day in numbers up to 150.

Great changes have taken place in the bird life of the northeast during the last quarter of a century. Speaking about this at the 1942 A. O. U. meeting in Philadelphia, Griscom stated it was his belief that those years have seen a far greater change in the status of many birds than any previous period of the same length. Happily there have been many more increases than declines. The author has ably discussed these changes under each species. Unfortunately, due to space limitations, he was not able to devote a chapter to a summary of these changes. It seems inconceivable that as many changes can take place in our avifauna during the next 20 years as have been evidenced by the past 20.

A total of 405 species and subspecies, including eight birds now extirpated, are included in the volume. In addition, three well-known hybrids are treated, though the various duck hybrids are wisely omitted. I myself have seen wild hybrids of Black-Mallard, Pintail-Gadwall and Gadwall-Mallard in the New York City area. Needless to say, any book of this sort is in a sense out of date as soon as it is published. As an example, on July 5, several weeks after the book came out, I found the nest and eggs of a European Goldfinch, which extended the egg dates, as given by Cruickshank, by over one month.

Although the New York City region has been so disturbed by civilization that it is hard to separate it into ecological units, Cruickshank lists 15 major ecological blocks, such as open ocean (two to ten miles out); (2) ocean (from shore to two miles out); (3) ocean beaches and sand dunes; (4) coastal bayberry; etc. Under each is listed the dominant and sub-dominant birds and their seasonal occurrence. There is a splendid discussion of the ornithological year, giving the approximate groupings and dates of arrival of migrants. The bulk of the book is taken up by an annotated list of birds, with an attempt to portray their approximate distribution, some of the reasons for this distribution—extreme dates, average dates and breeding status. Recognizing that each writer has his own concept of such words as *common, rare* and *casual,* Cruickshank has often indicated how many individuals of a species can be seen by a top-notch observer (such as himself) on a peak day. This has a concrete comparison value. Since not many people enjoy collecting privileges, and it is impossible to use such privileges in many places such as city parks where rare birds turn up, it is fortunate that so many of the rarities have been seen and checked by a number of observers; in these cases there can be no question of authenticity. In cases where a single person saw

[1] For additional reviews see pages 237 and 249.

a rare bird, Cruickshank has had to use his own judgment regarding the reliability of the observer, and he has handled this ticklish problem superbly.

Although there are minor points one might quibble with, such as the omission of a few records that probably did not come to his attention, the dynamic Mr. Cruickshank has written an excellent book which might well become a model for regional publications. The volume is attractively illustrated with 36 full-page reproductions of some of the photographs for which the author has become justly famous.—Roger T. Peterson.

Birds of North Carolina. By T. G. Pearson, C. S. Brimley, and H. H. Brimley. North Carolina Department of Agriculture, State Museum, Raleigh, N. C., 1942: 6⅜ x 9¼ in., xxxii+416 pp., 18 plain and 17 colored pls., 141 text figs. $3.50.

In 1919 Pearson and the Brimleys published their excellent book on North Carolina birds, the first comprehensive study of the birds of that region. Now, after 23 years, they have brought out an enlarged and completely revised book which includes 396 forms, 54 more than in the first edition.

One of the most noticeable improvements is in the illustrations. Some of the worst pictures—and they were sometimes very bad—have been replaced by new drawings by Roger Tory Peterson. In addition, Peterson and the publishers of his famous "Field Guide" have contributed the use of several of his full-page plates (four in color), figuring a large number of species. These plates are printed here with broad margins and therefore appear surprisingly larger than in the "Field Guide." The reproduction of the Peterson color plates is not as good here as in the original, but the loss is not serious. More of the poor color plates from the 1919 edition might better have been discarded since they only duplicate Peterson's much superior pictures of the same species. The majority of the text figures are still the Brasher drawings from the 1919 edition, often characterized by strange, oval eyes—and in some cases quite unidentifiable except for the accompanying legend (for example, three *Hylocichla* thrushes, the Bluebird, and the Phoebe).

We wish the authors had given us more on the habits of birds as observed in North Carolina in place of the many accounts, some not very pertinent, of the senior author's observations in distant places. Strangely, there is no general discussion of bird distribution in North Carolina, and far too many records are unnecessarily vague, with no mention of any locality more exact than the county.

Although North Carolina's ornithological history is a long one—the authors have carried it back to 1584—the true status of many species is still very little known. Clearly there is needed much more field work backed by thorough and discriminating collecting.

Some of the life-history information is sadly out of date. For example, we find quoted Chapman's 1907 statement that only one nest of the Connecticut Warbler has ever been found. It is disappointing, too, to read in a modern book about the "social outcast" Cowbird whose young are "selfish." The implication (p. 171) that any gull insists on unpolluted drinking water is too absurd to mislead any amateur, however untutored.

We suppose that the three full-page portraits of the authors were insisted upon by their enthusiastic friends.

The bibliography seems fairly complete and even includes some 1942 titles. Unfortunately volume numbers are given in the out-dated and easily mis-read roman numerals even when the original was written in arabic numerals. In view of the presence of 1942 titles in the bibliography it is surprising to note that earlier important papers like those of Wallace on the Gray-cheeked Thrushes (1939) and Griscom on the crossbills (1937) have been ignored.

In spite of the several minor faults, which this reviewer has probably overemphasized, this book is an important contribution to ornithology and will do much to stimulate and guide further work in North Carolina and nearby states.—J. Van Tyne.

Fading Trails: The Story of Endangered American Wildlife. By Daniel B. Beard, Frederick C. Lincoln, Victor H. Cahalane, Hartley H. T. Jackson, Ben H. Thompson. MacMillan, N. Y. 1942: 5½ x 8⅜ in., xv + 279 pp., 20 pls. (4 in color), 16 line drawings. $3.00.

In barest outline, the thesis of "Fading Trails" is this: "The arrival of a large number of well-armed and well-equipped white men on the continent of North America caused the greatest natural disturbance since the Ice Age. Man's imprint was made much more quickly than that made by the slow and tedious pace of a changing earth. Within the short space of some three hundred years, the rich wildlife resources had been reduced to a remnant of their former abundance and some species were gone forever. Many other species which became endangered in those years are today still on the verge of extinction, and are yet to be permanently saved" (p. viii) . . . "But most of the waste and greed and useless slaughter is in the past. Species have been rescued and saved" (p. 264).

The details of this sequence have been built up in a thoroughly interesting, and equally scholarly, way. An account of the early abundance of wildlife leads to brief discussions of its exploitation by market hunters (including commercial fisheries and whaling), poachers and game-hogs, and collectors, and of the effects of environmental change—"Human machinery, tearing away at the earth, disturbs conditions which nature has been countless centuries in creating. The reclamation of marshland for agriculture, the plowing up of prairie to plant corn, the dumping of sewage into clean rivers—such artificial conditions have within three centuries done more to decrease the numbers of American wildlife than the half-million years required by nature to deplete a species" (p. 11). The body of the book relates these causes to the animals which are now in gravest danger of extinction: the Bighorn, Woodland Caribou, Sea Otter and other rare fur-bearers, Manatee, Wolf, Mountain Lion, California Condor, Nene, Trumpeter Swan, Pinnated Grouse, Hudsonian Godwit, Everglade Swallow-tailed and White-tailed Kites, Florida Crane, Roseate Spoonbill, Whooper, Ivory-billed Woodpecker, Puerto Rican Parrot, Great Lakes Whitefish, Atlantic Salmon, Lobster, Green Turtle, and American Crocodile. A final chapter treats of an even longer list of animals (many of which, however, are geographic races) which are "close to the shadows." The final word is one of optimism: "Wildlife long ago stood at the crossroads. Today, in spite of scattered examples, it is definitely on the trail to recovery" (p. 264). To some, this may sound a bit over-optimistic.

The foreword warns the reader not to expect "natural history stories"; despite this, the book is fairly crammed with first-rate natural history and ecology.

Walter Weber's striking illustrations add a great deal to the interest of the book, but I must confess that I am not familiar enough with most of the subjects to judge the illustrations fairly.

The conservation movement has snowballed during the last ten or fifteen years, but there has been a too-general belief that it is primarily, or even wholly, a job for Government bureaus. It is a good sign that this book, written by "Bureau" men, lays the final responsibility on the public: the public must decide that the job shall be done and, once the ground-work of fact, land purchase (where needed), and regulation, has been laid, the individual must curb his trigger-itch and give the remnant populations a chance to build up again.—Frederick N. Hamerstrom, Jr.

Cuckoo Problems. By E. C. Stuart Baker. H. F. and G. Witherby, London, 1942: 5½ x 8½ in., xvi + 207 pp., 12 plates, eight colored. 25 s.

This book is the result of a life-long study of the cuckoo, first from the standpoint of an oologist and secondly from that of a field ornithologist. The author has in his collection nearly 6,000 cuckoo eggs, 1,500 of which are from Europe, 3,000 from Asia and the remainder from other parts of the world. Many of these eggs were collected by himself or by men under his direction, and others were

added by securing the collections of other people. He has traveled much and has spent many years in India, where he gained first-hand knowledge of native species. The seven appendices at the end of the book, covering twenty-seven pages, give a quantity of tabulated information concerning the collection, which includes eggs of thirty-eight species and subspecies of cuckoos, distributed among nine genera. Twelve of the forms fall under the genus *Cuculus,* and six are subspecies of *Cuculus canorus*, the species common in England and continental Europe. The eight colored-plates show eggs of various cuckoos and of their respective hosts.

The problems discussed are largely old ones. He shows that in western Europe the eggs of different races or gens of *Cuculus c. canorus* variously resemble those of their usual hosts, the Reed Warbler, Meadow Pipit, and Pied Wagtail, and that in west-central and western Europe, the eggs of another race resemble those of its host, the Garden Warbler. In Hungary ninety per cent of the cuckoo's eggs are laid in the nest of the Great Reed Warbler, whose eggs they closely resemble, and so on. The author explains in a plausible way how he thinks evolution has brought about this similarity of eggs, through the hosts' desertion of the nests or rejection of the cuckoo's eggs, when these eggs showed too strong a contrast to its own in color or size. The greater the contrast, he believes, the stronger is the host's tendency to destroy the eggs. His argument for a "need" of such evolution or adaptation, however, is not at all convincing.

He describes two methods of laying—direct laying and the projection of eggs into the nest by pressing the cloaca against the opening—but thinks there must be a third, since in some instances it is difficult to see how either of these first two methods could have been used. He makes the time-worn suggestion that the egg is placed in the nest by picking it up in the beak, and for proof he repeats a number of current stories, which, however, fail to prove the point.

To distinguish a cuckoo's eggs from those of a host, he explains, is often difficult. If color, size and shape are not sufficient, weight and texture of shell are additional aids. In most cases cuckoo's eggs are heavier than other eggs of the same size. The shell is hard though brittle, and feels gritty when handled. Under a lens the shell shows pores and grooves.

Baker considers most female cuckoos as having territory though they are not very closely attached to it. When they have used all the nests of a given area, they move to another area and perhaps later come back to the first. In such cases the territory may extend several miles. He believes that the number of eggs laid by *Cuculus* in a season is between fourteen and twenty. Mating, he thinks, is promiscuous. To explain evolution of egg types under this condition he favors the old and dubious theory that inheritance of kind of egg is through the females only.

The chief value of the book lies in the broad treatment of the many species of cuckoos and their eggs. In this field the work stands, and perhaps will remain, unrivaled. The biology, including the discussion of habits, however, is weak, especially when compared with that of Edgar P. Chance in his recent book, "The Truth About the Cuckoo."—Harry W. Hann.

The Vertebrate Eye and Its Adaptive Radiation. By Gordon Lynn Walls. Bulletin No. 19, Cranbrook Institute of Science, Bloomfield Hills, Mich. 1942: xiv + 785 pp., 197 figs., 1 pl. $6.50.

In the preface the author defines as the aim of this book: "to interpret comparative ocular biology as a whole to those who want to know what the eye is all about, but are repelled by the pedantic terminology of anatomy texts, the mathematics of physiological optics, the scatteredness of the ecological literature, and the German language." This sounds almost like an advertisement for a popularizing pamphlet. Yet the author has much higher ambitions. In fact, on picking up the weighty volume of 800 pages, one may very well feel inclined to

doubt the sincerity of the above quotation. With the same length of print H. G. Wells could explain the structure and function of the whole universe, and this book pretends simply to be a biology of the vertebrate eye, understandable for any "amateur naturalist" and of "particular benefit to zoologists and ecologists, medical and veterinary ophthalmologists, and comparative psychologists." The amazing thing about this book is that it fulfills all these promises. It gives a very complete review and an intelligent interpretation of the accumulated knowledge about eyes, especially that of the last century. Though no attempt is made to spare the reader by withholding procedures or results of meticulously planned and detailed investigations, the book reads like a fascinating novel, almost from the first to the last page. After all, man is eye-minded. In ever new ways do we find that the eye is the window through which we get our views of the universe and through which the outer world enters our conscious minds. There are, therefore, but few subjects in the study of nature that command an interest equal to that of the eye.

The subject is presented in many interestingly varied aspects. A first part contains the basic information concerning the morphology of the eye and the visual process. The second section treats of the adaptations of eyes to the exigencies of general as well as specialized environmental conditions. In the third part the eyes of the vertebrates are intercompared group by group from anatomical as well as physiological viewpoints. Such a triple treatment necessarily involves some repetition, though much of it is avoided by means of a rather unusual system of cross references. The comparative morphology convinces us that the human eye, though one of the most perfected types, is still outclassed by the eyes of many birds, which clearly reach the highest degree of perfection, at least in resolving power. One learns about the thirty theories that have been brought forward in the effort to explain the elaborate morphology of the pecten of the bird's eye, which is intimately correlated with the perfection of visual accommodation, and yet plays no obvious part in its mechanism. Emphasis is placed on evolutionary relationships such as appear in the sauropsidan type of retinal elements in monotremes and marsupials. The eye alone of these lower animals is convincing evidence of the reptilian origin of the whole mammalian class.

The foreign literature, especially the vast and important German portion, is extensively reviewed. Enjoyment of the book is greatly enhanced by about 200 well-chosen text figures (mostly original drawings), but especially by the strictly personal, and always highly expressive style of the author. Indelibly imprinted on the reader's mind remain the "primitive insectivoran knot-hole" through which "squeezed" whatever the higher placentals retained of primitive structural elements—and the phylogenetic tree upon which color perceptions first appeared "like Christmas decorations."

Here is a book that delights while you read it and remains a ready store of information when placed in your library.—Emil Witschi.

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Allen, Robert W., Ossian, Iowa 1936
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Anderson, Anders Harold, R. 5, Box 488, Tucson, Arizona 1937
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Anderson, Harry George, 409 Sidney St., Madison, Wisconsin 1940
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[1] This list is compiled as of November 1, 1942. The Secretary would appreciate immediate notification of any omission of names and changes in address, or errors in the spelling of names, the use of titles, and the exact year of first election to membership.

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*Boggs, Ira Brooks, Extension Division, West Virginia University, Morgantown, West Virginia 1938
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Brand, Charles Salmon, R. D. 2, Ithaca, New York 1941
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Brooks, Dr. Earl, Noblesville, Indiana 1941
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*Burt, Dr. William Henry, Museum of Zoology, Ann Arbor, Michigan ...1928
*Burtch, Verdi, Branchport, New York 1924
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*Carter, John Darlington, Lansdowne, Pennsylvania 1930
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Clebsch, Alfred, 838 Gracey Ave., Clarksville, Tennessee 1935
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Coleman, H[enry] S[hirl], Box 254, Faculty Exchange, College Station, Texas 1941
Collins, John A[rthur], Jr., 20 Quincy St., Lawrence, Massachusetts 1941
Coles, Victor, 2910 Grasselli Ave., Cincinnati, Ohio 1929
Comfort, James Earl, 27 N. Iola Dr., Webster Groves, Missouri 1941
Comfort, James F., 27 N. Iola Dr., Webster Groves, Missouri 1941
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Comstock, W. Ogilvie, New Ipswich, New Hampshire 1942
Conaway, Clinton Harper, 217 Third St., Aurora, Indiana 1942
Conrad, Charles Louis, 423 Warwood Ave., Wheeling, West Virginia 1937
Conway, Albert E., Box 135, West Chester, Pennsylvania 1939
Cooley, Miss Eleanor Graham, Bot.—Chem.—Pharm. Library, University of Iowa, Iowa City, Iowa 1936
Coombes, Robert Armitage Hamilton, Sea Bank, Bolton-le-Sands, Caraforth, Lancashire, England 1939
Cordes, William Joseph, Jr., 1115 Lullwater Rd., Atlanta, Georgia 1941
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Cottrell, George William, Jr., 4724 Alton Place, Washington, D.C. 1941
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Cunningham, James W., 4425 Main St., Kansas City, Missouri 1935
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Curtis, Miss Elizabeth Long, 5648 Beach Dr., Seattle, Washington 1935
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Dahlberg, Wendell [Oscar], 11312 S. Michigan Ave., Chicago, Illinois ... 1939
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Darsie, James C., Box 102, Skyland, North Carolina 1942
Davey, Winthrop N[ewbury], 2485 Hendee Rd., Jackson, Michigan 1941
*Davidson, William Mark, National Research Center, Beltsville, Maryland. 1933
Davis, Dr. David Edward, 721 Elmwood Ave., Wilmette, Illinois 1940
Davis, Edwin G., 24 Arlington St., Cambridge, Massachusetts 1941
Davis, George, State Teachers College, Murfreesboro, Tennessee 1936
Davis, George W., 3 Fremont St., Montpelier, Vermont 1941
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Davis, Mrs. Louie Irby, Box 988, Harlingen, Texas 1933
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Dear, Lt. Col. L[ionel] S[extus], Box 127, Port Arthur, Ontario, Canada.1939
Dechen, Mrs. Lillian Orvetta, 14 Sumner St., Port Dickinson (Binghamton P.O.), New York 1939
*Decker, C. O., 6450 Kenwood Ave., Chicago, Illinois 1938
*DeLury, Dr. Ralph Emerson, Dominion Observatory, Ottawa, Ontario, Canada 1920
Dempsey, Geoffrey Hamilton, Elmhurst Hall, The University, Reading, Berkshire, England 1940
**Desmond, Hon. Thomas C[harles], 94 Broadway, Newburgh, New York.1942
Deusing, Murl, 142 N. 75th St., Milwaukee, Wisconsin 1937
Devitt, Otto Edmund, 31 Willowbank Blvd., Toronto, Ontario, Canada...1935
Dickinson, Mrs. William Winston, 2006 Reid Ave., Bluefield, West Virginia 1942
Dille, Frederick Monroe, 822 Grand Ave., Nogales, Arizona 1912
Dingle, Edward von Seibold, Huger, South Carolina 1921
*Dixon, James Benjamin, R.R., Box 688, Escondido, California 1936
Dobbins, H[ugh] C[linton], 1456 W. Clifton Blvd., Lakewood, Ohio 1941
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Drill, Miss Edna, 202 S. Campus Ave., Oxford, Ohio 1942
Drum, Miss Margaret, Owatonna, Minnesota 1937
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*DuMont, Philip Atkinson, Fish and Wildlife Service, Merchandise Mart, Chicago, Illinois 1928
*Duncan, Donald Pendleton, 5841 Nickerson Ave., Chicago, Illinois 1936
.. Dusi, Julian Luigi, 886 Wilson Ave., Columbus, Ohio 1941
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*Eifrig, Prof. Charles William Gustave, Windermere, Orange Co., Florida..1907
Einspanier, Miss Helen M., 4140 Sarfy Ave., St. Louis, Missouri 1942
Eisenmann, Eugene, 574 West End Ave., New York City 1942
*Ekblaw, Dr. George Elbert, 511 W. Main St., Urbana, Illinois 1914
Elder, William Hanna, Natural Resources Building, Urbana, Illinois 1938
*Elliott, Dr. Richard M., 1564 Vincent St., St. Paul, Minnesota 1940
Ellis, Miss Hazel R., Kenka College, Kenka Park, New York 1942
***Ellis, Ralph, Jr., 2420 Ridge Rd., Berkeley, California 1926
Elwell, Mary I., State Teachers College, Duluth, Minnesota 1940
Emerson, David L[owell], 25 Everett Ave., Providence, Rhode Island...1939

*Emerson, Guy, 16 Wall St., New York City 1938
*Emilio, Shepard Gilbert, 7 Winter St., Salem, Massachusetts 1929
Emlen, Miss Eleanor Cope, Awbury, Germantown, Philadelphia, Pennsylvania 1942
Emlen, Dr. John Thompson, Jr., University of California, Davis, California 1936
Empey, Miller, Freeland, Michigan 1939
*English, Dr. Pennoyer Francis, Department of Zoology, Pennsylvania State College, State College, Pennsylvania 1934
Ennis, James Harold, Cornell College, Mount Vernon, Iowa 1942
Erickson, Arnold Burton, Division of Economic Zoology, University Farm, St. Paul, Minnesota 1938
*Erickson, Miss Mary Marilla, Santa Barbara State College, Santa Barbara, California 1930
Erickson, Ray C[harles], 1104 Washington Ave., St. Peter, Minnesota 1939
*Errington, Dr. Paul L[ester], Iowa State College, Ames, Iowa 1932
Etz, Mrs. Elizabeth [Cecilia], Thornhedge, Wheeling, West Virginia 1940
**Eustice, Alfred LeRoy, Bright Land Farm, Barrington, Illinois 1941
*Evans, Dr. Evan Morton, 550 Park Ave., New York City 1929
Faegre, David [Colin], Belfield, Stark Co., North Dakota 1940
Fahrenholz, Fred Emery, 2912 Elmo Place, Middleton, Ohio 1942
Fales, John House, 1917 Elkhart St., Silver Spring, Maryland 1939
**Fargo, William Gilbert, 506 Union St., Jackson, Michigan 1923
Farner, Donald S[tanley], Biology Bldg., Madison, Wisconsin 1941
Fautin, Reed W[inget], 1213 Clover Ave., Rockford, Illinois 1937
*Feeney, W. S., 808 E. Worden Ave., Ladysmith, Wisconsin 1937
Feighner, Miss Lena Veta, 298-I S. Tremont St., Kansas City, Kansas 1935
Ferrie, Robert Morris, Box 277, North Battleford, Saskatchewan, Canada 1940
*Finster, Miss Ethel Beulah, Asheville College, Asheville, North Carolina .. 1930
*Fiorucci, Americo Angelo, Box 5, Iron Mountain, Michigan 1941
Fischer, Richard Bernard, 140–19 Beech Ave., Flushing, New York 1942
Fisher, Josiah Howe Vose, Theta Delta Chi, Williamstown, Massachusetts. 1942
Fitzgerald, Mrs. Mary Elizabeth, R. 5, Box 480, Kirkwood, Missouri..... 1942
Fleetwood, Raymond Judy, Piedmont Wildlife Ref., Round Oak, Georgia 1934
Flentge, Louis George, 1564 Thacker St., Des Plaines, Illinois 1936
Fleugel, James B., 1104 American National Bank Bldg., Kalamazoo, Michigan 1942
Floyd, E[arl] Pershing, 303 E. 18th St., Tulsa, Oklahoma 1939
*Floyd, Judge Joseph Larke, 1009–11 George D. Harter Bank Bldg., Canton, Ohio 1903
Flynn, Michael Burke, 415 S. Crouse Ave., Syracuse, New York 1942
*Foote, Maurice Edwin, R. 1, Mantua, Ohio 1932
Ford, Edward Russell, Newaygo, Michigan 1914
Forsyth, Mrs. Louise [Ann], Lebanon Rd., Hanover, New Hampshire ... 1940
Fox, Adrian Caspar, Box 465, Lincoln, Nebraska 1937
France, H[oward] Owen, 821 Lincoln Place, Boulder, Colorado 1941
*Fredine, C[larence] Gordon, Department of Forestry and Conservation, Purdue University, Lafayette, Indiana 1938
Freeman, Robert M., R. 5, Laurel, Mississippi 1939
*French, Franklin C[ulbertson], 18102 Devonshire Rd., Northridge, California 1941
*Fruen, J[ohn] Donald, 1641 Brenner Pass, Tyrol Hills, Minneapolis, Minnesota 1940
Frye, Ozro Earle, Jr., Department of Fish and Game, A.&M. College of Texas, College Station, Texas 1940
*Fryklund, P. O., Roseau, Roseau Co., Minnesota 1926

*Furniss, Owen Cecil, 2203 1st Ave., West Prince Albert, Saskatchewan, Canada 1934
Furth, John [Thomas], 436 Felton Ave., Highland Park, New Jersey.... 1939
*Gabrielson, Dr. Ira Noel, Fish & Wildlife Service, Merchandise Mart, Chicago, Illinois 1913
Gadd, Samuel Wesley, II, 1019 N. Nevada Ave., Colorado Springs, Colorado 1941
*Gaillard, Stephen Lee, 9 Lee Place, Bronxville, New York 1942
**Ganier, Albert F[ranklin], 2112 Woodlawn Dr., Nashville, Tennessee.... 1915
Garrett, Miss Lois, 1709 Chestnut St., Kenova, West Virginia 1942
Garrison, David L., 121 Highland St., West Newton, Massachusetts..... 1940
*Gavin, Angus, Hudson's Bay House, Main St., Winnipeg, Manitoba, Canada 1942
Gensch, Robert H[enry], Lake States Forest Experiment Station, University Farm, St. Paul, Minnesota 1939
George, John L[othar], % J. Van Tyne, Museum of Zoology, Ann Arbor, Michigan 1939
Gerstell, Richard, Pennsylvania Game Commission, Harrisburg, Pennsylvania 1939
Gibbs, Harold N[elson], A-71 Sowams Rd., Barrington, Rhode Island... 1941
Gibbs, Walter C., Whitehall, Michigan 1941
Gier, Dr. Herschel Thomas, Ohio University, Athens, Ohio 1937
Gifford, Dr. Harold, 3636 Burt, Omaha, Nebraska 1936
Gilbert, Perry Webster, Department of Zoology, Cornell University, Ithaca, New York 1942
Gillett, Francis C., 828 Plymouth Bldg., Minneapolis, Minnesota 1935
Gillette, Delbert A., R. 5, Yakima, Washington 1942
Gillette, Miss Fredericka B., 1319 Forest Ave., Ann Arbor, Michigan 1938
Giltz, Maurice L[eroy], 841 Lincoln Way, N.W., Massilon, Ohio 1939
Ginn, W[illiam] E[dward], 511 East Van Buren, Columbia City, Indiana 1941
Glasgow, Leslie L., Portland, Indiana 1942
Glenn, Robert W., 509 Orchard Ave., Avalon, Pittsburgh, Pennsylvania.. 1934
Gloyd, Dr. Howard Kay, Chicago Academy of Sciences, 2001 N. Clark St., Chicago, Illinois 1925
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Good, Ernest E[ugene], 283 S. 4th St., Orleans, Indiana 1940
Goodell, Fred C[harles], Edmore, Michigan 1940
Gooden, [Elmer] Clayton, Glasgow, Kentucky 1941
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Goslin, Charles R[ussell], 407 Washington Ave., Lancaster, Ohio 1940
*Grange, Wallace, Babcock, Wisconsin 1941
*Grant, Cleveland Putnam, 620 Greenup St., Covington, Kentucky..... 1928
Graves, Miss Katherine, 1209 N. Illinois St., Indianapolis, Indiana..... 1942
*Gray, William Arthur, Room 690, 508 S. Dearborn St., Chicago, Illinois.. 1938
Greeley, Fred, 200 Chestnut St., Winnetka, Illinois 1942
Green, Miss Rhoda J[anet], 1769 Bardstown Rd., Louisville, Kentucky.. 1940
**Greene, Albert E., 1841 Cambridge Rd., Ann Arbor, Michigan 1939
Greene, Earle Rosenbury, Box 466, Key West, Florida 1930
Greenhalgh, Clifton M., Kanab, Utah 1939
*Gregg, Miss Pearl, Middlebourne, West Virginia 1942
*Gregory, Stephen Strong, Jr., Box N., Winnetka, Illinois 1922
Griffin, Donald R[edfield], Biology Laboratory, Harvard University, Cambridge, Massachusetts 1941
Grimes, 825 South Shores Drive, Jacksonville, Florida 1924
*Grimm, William C[arey], 613 S. Braddock Ave., Pittsburgh, Pennsylvania 1939
Grinnell, Lawrence I[rving], 710 Triphammer Rd., Ithaca, New York.... 1939

*Griscom, Ludlow, Museum of Comparative Zoology, Cambridge, Massachusetts 1937
Griswold, John A[ugustus], Jr., 115 South St., Auburn, New York 1941
Grose, E. R., Glenville, West Virginia 1939
Groskin, Horace, 210 Glenn Rd., Ardmore, Pennsylvania 1937
*Gross, Dr. Alfred Otto, Bowdoin College, Brunswick, Maine 1927
Grossenheider, Richard P., 5415 Gilmore Ave., St. Louis, Missouri 1940
Gunderson, Harvey Lorraine, % H. Gunderson, Gary, Minnesota 1941
Haak, A[drian], 437 Eugenie St., St. Boniface, Manitoba, Canada 1939
Haas, Miss Bernece Estelle, Bowdon, North Dakota 1940
Hackett, Miss Cora Janet, 3934 Avery Ave., Detroit, Michigan 1941
*Haecker, Frederick Woods, 506 S. 52nd St., Omaha, Nebraska 1938
*Hagar, Mrs. Jack, Box 339, Rockport, Texas 1930
*Hague, Dr. Florence S., Sweet Briar College, Sweet Briar, Virginia 1931
Hahn, Miss Helen H[amilton], 968 Jefferson Ave., Akron, Ohio 1941
Haines, T. P., 1428 White St., Ann Arbor, Michigan 1941
*Hainsworth, William Pickard, 216 Railroad Ave., North Andover, Massachusetts 1930
*Hallman, Roy Cline, Box 826, Panama City, Florida 1928
*Hamerstrom, Frederick N., Jr., Edwin S. George Reserve, Pinckney, Michigan 1934
Hamilton, Mrs. R. E., 208 College St., Dalton, Georgia 1942
*Hamilton, Dr. William J[ohn], Jr., Department of Zoology, Cornell University, Ithaca, New York 1933
Hammond, Merrill C[lyde], Lower Souris Refuge, Upham, North Dakota.1939
*Handley, Charles Overton, Virginia Polytechnic Institute, Blacksburg, Virginia 1925
*Handley, Charles Overton, Jr., Blacksburg, Virginia 1941
*Hann, Dr. Harry Wilbur, Department of Zoology, University of Michigan, Ann Arbor, Michigan 1930
Hanna, Wilson Creal, 141 E. F St., Colton, California 1936
Hanson, E. C., 1305 Wisconsin Ave., Racine, Wisconsin 1940
Hanson, H. C., U.S.N.A.S., Grosse Ile, Detroit, Michigan 1939
Happ, Prof. George Bippus, The Principia College, Elsah, Illinois 1935
Hardy, [Cecil] Ross, Dixie College, Saint George, Utah 1940
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*Harper, Dr. Francis, 224 S. Chester Rd., Swarthmore, Pennsylvania 1930
**Harriot, Samuel Carman, 200 W. 58th St., New York City 1934
*Harris, Russell B[enjamin], Arcanum, Ohio 1941
Harrison, Mrs. G. O., 628 Lynn Ave., Weston, West Virginia 1942
*Harrison, Harold Holmes, The Valley Daily News, Tarentum, Pennsylvania 1941
*Hartman, Frank A[lexander], Hamilton Hall, Ohio State University, Columbus, Ohio 1941
*Hartwell, Arthur Mowry, 2324 Lake Place, Minneapolis, Minnesota 1940
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**Havemeyer, Henry Osborne, Mahwah, New Jersey 1930
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Hearne, Miss Clara Josephine, Box 68, Roanoke Rapids, North Carolina..1942
Hebard, Frederick V., 1500 Walnut St. Bldg., Philadelphia, Pennsylvania..1940
Heckler, S. B., 1207 N. 7th St., St. Louis, Missouri 1942
*Hefly, Harold M[artin], Department of Biology, Texas Technological College, Lubbock, Texas 1942
*Heidenkamp, Joseph, Jr., 538 Glen Arden Dr., Pittsburgh, Pennsylvania..1942
Heiser, J[oseph] M[atthew], Jr., 1724 Kipling St., Houston, Texas 1939

Helfer, Miss Louise, 111 Ninth St., Watkins Glen, New York 1937
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*Henderson, Walter Cleaveland, 8 Magnolia Parkway, Chevy Chase, Maryland 1928
*Hendrickson, Dr. George Oscar, Department of Zoology, Iowa State College, Ames, Iowa 1933
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Henwood, Mrs. Ethel May, 609 W. Ohio St., Urbana, Illinois 1941
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Hickey, J. J., 424 University Farm Place, Madison, Wisconsin 1940
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Hiett, Lawrence Davison, 1945 Ottawa Drive, Toledo, Ohio 1929
Higgins, Harold Guymon, 257 South 5th, W., Provo, Utah 1941
Hill, Herbert Oliver, 329 Summit Ave., Redlands, California 1938
Hill, Mrs. Julian Werner [Mrs. Louisa B.], 1106 Greenhill Ave., Wilmington, Delaware 1935
Hill, Norman Pierce, 15 Oxford St., Arlington, Massachusetts 1941
Hill, Raymond W., 3316 Kenmore Rd., Shaker Heights, Cleveland, Ohio..1941
*Hillmer, Davis B., 448 W. Ferry Ave., Detroit, Michigan 1926
*Hilton, Dr. David Clark, 305 Richards Bldg., Lincoln, Nebraska.....1918
*Hinds, Frank J., Department of Biology, Western State Teachers College, Kalamazoo, Michigan 1935
Hinshaw, Thomas Doane, Museum of Zool., Ann Arbor, Michigan.....1926
Hitchcock, John D., Bee Culture Laboratory, Laramie, Wyoming 1941
Hobson, Mrs. L. G., Bloomingdale, Indiana 1935
Hoffman, Paul William, 841 Kenyon Ave., Wauwatosa, Wisconsin 1940
Hoffmeister, Linus C[hristian], 504 W. Ripa Ave., Lemay, Missouri 1939
*Holabird, Christopher, 2236 Lincoln Park, W., Chicago, Illinois 1940
*Holland, Harold May, Box 615, Galesburg, Illinois 1915
Hoodema, Richard, 116 W. 14th St., Holland, Michigan 1941
Horton, Mrs. Louise D., 360 Prospect St., Fall River, Massachusetts.....1941
Hostetter, D[avid] Ralph, Eastern Mennonite School, Harrisonburg, Virginia 1937
Hoth, L. George, 4 Cross Place, Glen Ridge, New Jersey 1941
Hotchkiss, Neil, Patuxent Research Refuge, Bowie, Maryland 1940
Hough, Mrs. Eleanor Sloan, 4820 Olentangy Blvd., Columbus, Ohio 1941
*Howard, William J., 5518 Fairglen Rd., Chevy Chase, Maryland 1940
Howell, Joseph Corwin, Department of Zoology, Oklahoma A. & M. College, Stillwater, Oklahoma 1938
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Hoyt, J[ohn] Southgate Y[eston], Fernow Hall, Cornell Univ., Ithaca, New York 1936
Huggins, Russell A., Eastern State Teachers College, Madison, South Dakota 1937
*Hughes, George Thomas, R. 3, Plainfield, New Jersey 1929
Hulbert, Lloyd Clair, 529 W. Grand River Ave., East Lansing, Michigan..1938
*Hunt, Ormond Edson, 14-133 General Motors Bldg., Detroit, Michigan..1937
Hunter, Lawrence E., Middle Grove, Illinois 1934
Hurley, John Beatty, 401 S. 17th Ave., Yakima, Washington 1937
Hutchinson, Arthur E., Chester Springs, Chester Co., Pennsylvania.....1940
Hutchinson, Miss Cora W., 311 Prospect St., Alton, Illinois 1942
Hyde, A[ethus] Sidney, University of Idaho, South Branch, Pocatello, Idaho 1939
Imsick, Roy Christian, 7512 N. 20th St., Philadelphia, Pennsylvania 1941
*Ingersoll, Albert Mills, 908 F. St., San Diego, California 1921
**Ingersoll, Marion Crory, 380 Clinton Ave., Brooklyn, New York 1942

*Jackson, Francis Lee, 541 Hammond St., Chestnut Hill, Massachusetts....1941
Jaques, F[rancis] L[ee], 610 W. 116th St., New York City 1939
Jameson, Everett Williams, Jr., 216 Delaware Ave., Ithaca, New York..1941
Jameson, John D., Sugar Hill, New Hampshire 1941
*Jamison, Conrad Heston, 2811 Acklen Ave., Nashville, Tennessee 1940
*Janvrin, Dr. Edmund R. P., 38 E. 85th St., New York City 1942
Jarvis, Carson M[cAllister], Med. Det. Dept., 1213 R. C., Fort Niagara, New York 1940
Jenkins, James H[obart], Wildlife Research Station, Ohio State University, Columbus, Ohio 1939
*Jenner, William Alexander, 806 W. Davis St., Fayette, Missouri 1933
Johanson, Miss Flora Ingeburg, 1 Luddington Rd., West Orange, New Jersey 1942
Johnson, Perry Frank, Y.M.C.A., Michigan City, Indiana 1935
*Johnson, Mrs. Irene W., 38 Portland Place, St. Louis, Missouri 1931
*Johnson, Robert Anthony, 150 East St., Oneonta, New York 1930
Johnson, William M[cNutt], 108 E. Depot St., Knoxville, Tennessee ...1939
Johnston, Miss Irma K., 23 Dewey Ave., Huntington, New York 1941
Johnston, Miss Verna R[uth], Thornton Township High, Harvey, Illinois.1941
*Jonah, Miss Christie May, 407 River St., Hackensack, New Jersey.....1942
*Jones, Harold Charles, Thomas Berry College, Mount Berry, Georgia....1929
*Jones, John Courts, Research Center, Delmar, New York 1931
****Jones, Dr. Lynds, 352 W. College St., Oberlin, Ohio.....Founder
Jones, Paul F., R. 1, Howard City, Michigan 1937
Jones, Victor Emmons, University of Idaho, Southern Branch, Pocatello, Idaho 1938
Jorae, Miss Irene Frances, Central Michigan College of Education, Mt. Pleasant, Michigan 1942
Jurica, E., Lisle, Illinois 1940
Kahmann, Mrs. Karl W., R. 2, Hayward, Wisconsin.....1941
Kahn, Mrs. Dina Hope, 1122 Michigan Ave., Ann Arbor, Michigan.....1938
*Kalmbach, Edwin Richard, Fish and Wildlife Service, 546 Customhouse, Denver, Colorado 1926
*Kase, John Charles, Versailles, Indiana 1937
Kaufman, Herbert P[eter], 30 N. 28th St., Harrisburg, Pennsylvania....1941
*Kelker, George Hills, School of Forestry, U.S.A.C., Logan, Utah.....1938
Kelly, Mrs. George A. [Mrs. Evelyn], 2300 La Salle Gardens, N., Rochester, Michigan 1935
*Kelso, Leon, 1370 Taylor St., N.W., Washington, D.C. 1930
*Kendeigh, Dr. S[amuel] Charles, Vivarium Bldg., University of Illinois, Champaign, Illinois 1923
Kennedy, H. N., Box 294, Rosslyn Station, Arlington, Virginia 1924
Kiefer, Mrs. Elizabeth D(eyo), 243 Gratiot Blvd., Port Huron, Michigan.1941
*Kieran, John, 4506 Riverdale Ave., Bronx, New York City 1942
*Killion, Jack C., 6916 Valjean Ave., Danbury, Connecticut 1942
Kindler, Mrs. Grace Emma, Sheridan Dr., Lancaster, Ohio 1937
Kinzel, Carl, 4149 N. 52 St., Milwaukee, Wisconsin 1941
Kirk, Allan D[ixon], 14 Forest Hill Rd., Wilkinsburg, Pennsylvania 1939
Kirkpatrick, Charles Milton, Department of Forestry, Purdue University, Lafayette, Indiana 1941
*Klinkerfuss, Dr. G. H., 340 Bermuda Ave., Normandy, Missouri 1941
*Klinkerfuss, Mrs. G. H., 340 Bermuda Ave., Normandy, Missouri 1941
Klonic, Allan S., 28 Ericsson St., Rochester, New York 1941
Kluge, Helen H[enrika], 216 Woodlawn Terrace, Waterbury, Connecticut.1942
*Knapp, Elmer Leslie, R. 2, Troy, Pennsylvania 1930
Knight, Charles Harold, 20700 Gladstone Rd., Cleveland, Ohio 1939

Knox, Miss Margaret Richardson, 4030 Park Ave., Indianapolis, Indiana.1937
Koch, Peter, Terrace Park, Ohio 1939
Koehler, Mrs. Arthur, 109 Chestnut St., Madison, Wisconsin 1941
Koestner, E. J., Box 263, Piper City, Illinois 1938
Kolb, Charles Haven, Jr., 5210 Catalpha Rd., Baltimore, Maryland 1937
Kosten, John Leonard, 967 Pine Ave., Grand Rapids, Michigan 1939
Kozacka, Frank J[oseph], 81 Cedar St., Amesbury, Massachusetts.....1941
Kramer, Theodore Christian, Department of Anatomy, East Medical Bldg., Ann Arbor, Michigan 1939
Kraus, Douglas L., Rhode Island State College, Kingston, Rhode Island..1942
Kreag, Keith K., R. 2, Box 196, Lansing, Michigan 1942
Kuerzi, Richard C., R.F.D., Kent, Connecticut 1942
Kuitert, Lt. Louis Cornelius, 706 Florence St., Kalamazoo, Michigan.....1938
*Kutz, Harry Leon, Game Research Center, Delmar, New York 1939
Kyllingstad, Henry C[arrell], Mountain Village, Alaska 1940
Lacey, Miss Mifton H., % Canton Girl Scouts, 433 Tusc. W. Headquarters, Canton, Ohio 1939
Laffoon, Jean [Luther], 1401 W. 3rd St., Sioux City, Iowa 1940
Lagler, Dr. Karl F., Department of Zoology, University of Michigan, Ann Arbor, Michigan 1941
Lake, Robert N., Wilton, New Hampshire 1941
*Lambert, Bert, 16854 Wildemere Ave., Detroit, Michigan 1936
Lamore, Donald Hart, 1920 Grace Church Rd., Silver Spring, Maryland..1942
Lanning, Robert George, 56 Chatsworth Dr., Toronto, Ontario, Canada..1942
Larrabee, Miss Harriet, Y.W.C.A., Duluth, Minnesota 1942
*Larrabee, Prof. Austin Park, Yankton College, Yankton, South Dakota...1921
*Laskey, Mrs. Amelia Rudolph, Graybar Lane, Nashville, Tennessee 1928
Latham, Roger M., R. 2, West Chester, Pennsylvania 1942
Lawrence, Pvt. Roger William, Med. Det., 197th Coast Art., (A.A.), A.P.O. 111, Postmaster, San Francisco, California 1942
Lay, Daniel Wayne, Game, Fish, and Oyster Commission, Austin, Texas..1939
Lea, Robert Bashford, 737 Center St., Elgin, Illinois 1940
Lee, Dr. Howard James, 100 Elmwood, Oshkosh, Wisconsin 1941
Leedy, Dr. Daniel Lovey, Ohio Wildlife Research Station, Ohio State University, Columbus, Ohio 1936
Leenhouts, Miss Pearle Esther, Pease Rd., Williamson, New York 1941
Legg, William C[larence], Mt. Lookout, West Virginia 1939
Leonard, Mrs. J. W., Hunt Creek Experiment Station, Lewiston, Michigan 1941
*Leopold, Prof. Aldo, 424 University Farm Place, University of Wisconsin, Madison, Wisconsin 1928
Leopold, A[ldo] Starker, Box 247, West Plains, Missouri 1940
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Levy, Mrs. Alice K[lund], 235 E. 22 St., Apt. 11T, New York City.....1941
Lewis, Dr. Harrison Flint, Lands, Parks, and Forest Branch, Department of Mines and Resources, Ottawa, Ontario, Canada 1939
Lewis, Brother Hubert, Cretin High School, St. Paul, Minnesota 1940
*Lewy, Dr. Alfred, 2051 E. 72nd Place, Windsor Park, Chicago, Illinois...1915
Lincoln, Frederick Charles, Fish and Wildlife Service, Washington, D.C..1914
Lindsey, Dr. Alton Anthony, 103 S. Stanford St., Albuquerque, New Mexico 1936
Lindzey, James S., 901 W. 22nd St., Wilmington, Delaware 1942
*Linsdale, Dr. Jean Myron, Jamesburg Route, Monterey, California 1928
Linton, M[orris] Albert, 315 E. Oak Ave., Moorestown, New Jersey 1941
Lloyd, Clark K., 119 N. Pearl St., Richmond, Indiana 1925

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Lockley, R. M., Skokholm Bird Observatory, Dale, Haverfordwest, Pembrokeshire, Wales, Great Britain 1940
Lodge, William Ralph, Silver Lake Estates, R. 2, Cuyahoga Falls, Ohio ... 1935
Loefer, John B[enjamin], 28 Chestnut St., Berea, Kentucky 1941
Long, Miss Janie, 319 Hawthorne, Greensburg, Pennsylvania 1942
Long, Samuel T., Ohio Wildlife Research Station, Ohio State University, Columbus, Ohio 1941
Lord, Mrs. Caroline Morse, R.F.D., Francestown, New Hampshire 1942
Lord, Dr. Frederick P[omeroy], 39 College St., Hanover, New Hampshire 1939
*Loring, Miss Elizabeth, 176 Ashland St., Melrose Highlands, Massachusetts 1942
Lovell, Harvey B., 3011 Meade Ave., R. 3, Box 216, Louisville, Kentucky. 1936
*Lovett, Emery, Jr., 2621 Via Ramon, Palos Verdes Estates, California .. 1942
Low, Dr. Jessop, Illinois Natural History Survey, Havana, Illinois 1941
*Low, Seth Haskell, Salt Plains Wildlife Refuge, Fish and Wildlife Service, Jet, Oklahoma 1931
***Lowery, George Hines, Jr., Museum of Zool., Louisiana State University, University, Louisiana 1937
*Lubin, Seymour I., 101 Chestnut St., Binghampton, New York 1934
*Ludwig, Claud Charles, 506 Wilson Bldg., Lansing, Michigan 1938
Ludwig, Dr. Frederick Edwin, 2864 Military St., Port Huron, Michigan.. 1941
Lum, Miss Elizabeth C[aroline], Cincinnatus, New York 1940
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Luthy, Ferd, Jr., 306 N. Institute, Peoria, Illinois 1937
Lynes, Miss Florence A., Cook's Station, Missouri 1937
MacArthur, John W[ood], 200 Glencairn Ave., Toronto, Ontario, Canada 1941
MacDonald, Charles Edwin, 8 Sussex Ave., Toronto, Ontario, Canada.... 1942
MacDonald, Donald L[aurie], 72 Alexander Blvd., Toronto, Ontario, Canada 1941
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MacLean, Miss Dorothy W[illiams], 21 Ashley St., Hartford, Connecticut. 1939
MacLulich, Dr. D. A., 144 Mavety St., Toronto, Ontario, Canada..... 1933
*MacMartin, Mrs. W. G., 602 State St., Tama, Iowa 1942
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McBeath, Donald Young, L'Anse, Michigan 1936
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McCann, Lester J., 3743 Emerson Ave., N., Minneapolis, Minnesota..... 1939
McClanahan, Robert Charles, Fish and Wildlife Service, Washington, D.C.. 1935
McClelland, Elizabeth, Eicher Rd., R. 3, Bellevue, Pennsylvania 1942
McClure, H. Elliott, 315 S. 17th St., Ord, Nebraska 1942
McCollough, Miss Leta, Chicora, Pennsylvania 1942
*McCreary, Otto, Agr. Hall, University of Wyoming, Laramie, Wyoming.. 1930
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McDonald, Malcolm, Parsons College, Fairfield, Iowa..... 1936
McGraw, Charles F[rancis], 1006 S. Locust St., Champaign, Illinois..... 1940
McGraw, Harry A., 1600 5th Ave., Altoona, Pennsylvania 1936
McHugh, Janet Procter, 123 Lafayette Circle, Cincinnati, Ohio 1942
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McIntosh, William Baxter, 414 Oakridge Blvd., Lynchburg, Virginia 1942
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*McMath, Robert R., R. 4, Pontiac, Michigan 1934

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McMurray, Frank B[ailey], Wichita Mountains Wildlife Refuge, Cache, Oklahoma 1939
*McNeil, Dr. Charles Andrew, 111 W. Fourth St., Sedalia, Missouri 1914
McNish, Edgar Mann, Madison, Tennessee 1940
Mack, Horace Gordon, % Gilson Mfg. Co., Ltd., Guelph, Ontario, Canada.1937
Madden, Will Earl, Box 173, Rensselaer, Indiana 1942
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Magney, Mrs. G. R., 5329 Washburn Ave., S., Minneapolis, Minnesota...1940
Maguire, Walter Stanley, 216 3rd St., New Westminster, British Columbia, Canada 1937
Malan, Harriss C., 426 Packard St., Ann Arbor, Michigan 1942
Malley, Philip Patrick, 823 Sunshine Ave., Youngstown, Ohio 1935
Manners, Edward Robert, 233 Maple Ave., Westville, New Jersey 1942
Manville, Richard H[yde], Museum of Zoology, University of Michigan, Ann Arbor, Michigan 1941
Manz, Pvt. Frank J., Jr., 12th Technical School Squadron, Scott Field, Illinois 1938
*Marsh, Vernon L., Johnson Hall, University of Washington, Seattle, Washington 1934
Marshall, D. M[cArthur], Hornings Mills, Ontario, Canada 1941
Marshall, William H., Room 415, Federal Bldg., Boise, Idaho 1942
Martin, Miss Dorothy May, Paige Hill Rd., Goffstown, New Hampshire..1942
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Mason, Miss Esther, 2523 Montgomery St., Louisville, Kentucky 1941
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Mathiak, Harold A[lbert], Babcock, Wisconsin 1941
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Mayfield, Harold F[ord], 3311 Parkwood Ave., Toledo, Ohio 1940
*Mayr, Dr. Ernst, American Museum of Natural History, Central Park West at 79th St., New York City 1933
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Mellinger, E. O., North Lima, Ohio 1939
Meltvedt, Burton W., Paullina, Iowa 1930
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Mendall, Howard L., 28 Pendleton St., South Brewer, Maine 1936
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*Meyer, Mrs. Marie McGinley, 1125 Lane Ave., Tarentum, Pennsylvania..1941
Michaud, Howard H[enry], 1205 Kensington Blvd., Fort Wayne, Indiana 1938
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Miller, Alden Holmes, Museum of Vertebrate Zoology, Berkeley, California 1930
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Miller, Loye (Holmes), University of California at Los Angeles, Los Angeles, California 1939
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Mills, Robert H[enry], 2466 Medary Ave., Columbus, Ohio.....1941
Milnes, Miss Hattie Kernahan, 331 Gowen Ave., Philadelphia, Pennsylvania 1935

*Minich, Edward C., 1047 Fairview Ave., Youngstown, Ohio 1923
Mitchell, Earl T[homas], Box D, Horicon, Wisconsin 1940
Mitchell, Harold Dies, 378 Crescent Ave., Buffalo, New York 1936
*Mitchell, Mrs. Osborne, R. 1, Streetsville, Ontario, Canada 1933
Mitchell, Robert H., 19 S. Liberty St., New Concord, Ohio 1941
**Mitchell, Dr. Walton Iungerich, 398 Vassar Ave., Berkeley, California..1893
Moeran, Edward Henry, 541 Bronx River Rd., Yonkers, New York.....1940
*Moffitt, James, 1879 Broadway, San Francisco, California 1931
Mohler, Levi L., Box 623, Ogallala, Nebraska 1942
Mohr, Dr. Carl Otto, Illinois Natural History Survey, Urbana, Illinois..1936
*Monk, Harry Crawford, 406 Avoca St., Nashville, Tennessee 1920
*Monroe, Burt Leavelle, Ridge Rd., Anchorage, Kentucky 1935
Monson, Gale, P.O. Box 1032, Yuma, Arizona 1933
Montagna, William, Department of Zoology, Cornell University,
Ithaca, New York 1937
*Moore, Miss Clara Alma, 3510 W. Michigan St., Indianapolis, Indiana..1939
*Moore, Miss Dora, 60 E. Mulberry St., Athens, Ohio 1934
Moore, George A., R. 3, Stillwater, Oklahoma 1938
Moore, George M[itchell], 210 S. College Dr., Bowling Green, Ohio 1942
Moore, Miss Laura Brooks, French Creek, West Virginia 1941
Moore, Miss Louise Christine, 766 N.W. 13th Ave., Miami, Florida 1940
Moore, Paul Joseph, Ohio Wildlife Research Station, Ohio State
University, Columbus, Ohio 1942
Moore, Robert Thomas, R. 1, Box 28A, Pasadena, California 1941
Moorman, Robert B., 137 Lynn St., Ames, Iowa 1941
Morrell, Miss Elsie, 148 W. Peachtree St., Knoxville, Tennessee 1942
*Morse, Miss Margarette Elthea, 11432 Mayfield Rd., Cleveland, Ohio..1921
Morse, Marius, 4031 40th Ave., Robbinsdale, Minnesota 1938
*Moseley, Edwin Lincoln, State College, Bowling Green, Ohio 1925
**Moser, Dr. R[euben] Allyn, 1407 Med. Arts Bldg., Omaha, Nebraska...1940
Moul, Edwin Theodore, R. 5, York, Pennsylvania 1942
*Moulton, Miss Paulina Etta, Lower School St., Sanford, Maine 1942
Mouser, Gilbert Warren, 508 Eastern Ave., Greenville, Illinois 1942
*Mousley, William Henry, 4073 Tupper St., Westmount, Montreal,
Quebec, Canada 1922
**Mudge, Edmund W., Jr., 4105 Averill Way, Dallas, Texas 1939
Mueller, Walter Josef, 3043 N. Prospect Ave., Milwaukee, Wisconsin....1936
Muirhead, Miss Peggy, 608 E. State, Ithaca, New York 1940
Mundy, Miss Barbara B., 1009 Park Ave., New York City 1942
Munro, James Alexander, Okanagan Landing, British Columbia, Canada..1935
*Munter, Capt. William Henry, U.S. Coast Guard, 550 Federal Bldg.,
Seattle, Washington 1933
Murdock, James Ingram, 311 Irving Ave., Glendale, California 1940
*Murie, Adolph, Jackson, Wyoming 1932
*Murie, Olaus Johan, Jackson, Wyoming 1934
*Murray, Rev. Joseph James, Lexington Presbyterian Church, Lexington,
Virginia 1931
*Musgrave, Dr. John Knox, 350 Parkway Dr., Pittsburgh 16, Pennsylvania.1937
Musselman, T[homas] E[dgar], 124 S. 24th St., Quincy, Illinois 1940
Nash, Nathaniel C[ushing], 1 Reservoir St., Cambridge, Massachusetts..1941
*Neely, William W., 149 West End St., Chester, South Carolina 1939
*Neff, Johnson Andrew, 546 Custom House, Denver, Colorado 1920
Nelles, Arthur D., 223 McLeod St., Ottawa, Ontario, Canada 1940
*Nelson, Arnold Lars, Fish and Wildlife Service, Washington, D.C. 1932
Nelson, Charles Ellsworth, Jr., 124 Oxford Rd., Waukesha, Wisconsin....1937
Nelson, Edwin L[ewis], 77 Adelaide Ave., New Brunswick, New Jersey..1939

Nelson, Martin Knute, State Game Warden, Fertile, Minnesota 1939
**Nelson, Dr. Theodora, 2695 Heath Ave., New York City 1928
Nelson, Urban C., Soil Conservation Service, Cannon Falls, Minnesota....1939
Netting, M. Graham, Carnegie Museum, Pittsburgh, Pennsylvania 1941
Newcomer, Miss Ruth Chisholm, "Folly Hill," Novelty, Ohio 1942
Newman, B. Barnett, 343 E. 19th St., New York City 1942
*Newth, Donald J[ennings], 480 W. Kirby St., Detroit, Michigan 1939
Newton, Earl T[homas], 5500 College St., Kansas City, Missouri 1939
*Nice, Dr. Leonard B., 5708 Kenwood Ave., Chicago, Illinois 1932
*Nice, Mrs. Margaret Morse, 5708 Kenwood Ave., Chicago, Illinois 1921
*Nichols, Charles Ketcham, 212 Hamilton Rd., Ridgewood, New Jersey..1933
Nichols, John Treadwell, American Museum of Natural History, Central Park West at 79th St., New York City 1941
Nichols, L[eon] Nelson, 331 E. 71st St., New York City 1937
Norris, Robert Allen, 1408 N. College Ave., Tifton, Georgia 1941
Norris, Russell T[aplin], Box 847, Preston Laboratory, Butler, Pennsylvania 1939
*Norse, William J[ohn], 531 W. 211th St., New York City 1939
North, George Webster, 249 Charlton Ave., Hamilton, Ontario, Canada..1941
*Norton, Arthur Herbert, Portland Society of Natural History, 22 Elm St., Portland, Maine 1934
*Oberholser, Dr. Harry Church, Cleveland Museum of Natural History, Cleveland, Ohio 1894
O'Conner, Miss Esther Laura, 4344 Locust Avenue, Kansas City, Missouri.1940
*Odum, Dr. Eugene Pleasants, Department of Zoology, University of Georgia, Athens, Georgia 1930
*Ohern, D. W., 515 N.W. 14th St., Oklahoma City, Oklahoma 1938
Oliver, Miss Mary Clara, Ganado Mission, Ganado, Arizona 1934
Olsen, Humphrey A., Brevard College, Brevard, North Carolina 1941
*Olsen, Dr. Richard Ellsworth, St. Joseph's Hospital, Pontiac, Michigan..1937
Olson, Mrs. Gladys E., 17906 Lake Rd., Lakewood, Ohio 1942
*Osgood, Dr. Wilfred Hudson, Field Museum of Natural History, Chicago, Illinois 1910
Osmer, Thomas L[ewis] G[regory], 2777 Flint River Rd., Lapeer, Michigan 1939
*Otis, Dr. Charles Herbert, Department of Biology, Bowling Green State University, Bowling Green, Ohio 1937
Ott, Frederick Louis, 2527 N. Wahl Ave., Milwaukee, Wisconsin 1941
*Overing, Robert, R.F.D., Raleigh, North Carolina 1930
*Owre, Oscar, Jr., 2625 Newton Ave., S., Minneapolis, Minnesota 1935
*Palmer, Ralph Simon, Department of Zoology, Vassar College, Poughkeepsie, New York 1934
*Palmer, Dr. Theodore Sherman, 1939 Biltmore St., N.W., Washington, D.C. 1914
Parker, Henry M[elville], 122 School St., Concord, New Hampshire 1941
Parker, Lansing A[rthur], 1133 N. Chatsworth, St. Paul, Minnesota 1939
Parks, Richard A., 546 Morgan St., N.E., Atlanta, Georgia 1942
Paschen, Miss Margaret F., 7 S. Balch St., Hanover, New Hampshire ...1941
Patterson, Miss LaRue, 344 Ridge Ave., New Kensington, Pennsylvania..1942
Paxton, Thomas R[ice], 1064 E. Clifton Rd., N.E., Atlanta, Georgia 1941
*Pearce, John, Wildlife Research Station, University of Maine, Orono, Maine 1939
*Peartree, Edward William, 425 S. State St., Oconomowoc, Wisconsin 1941
*Peasley, Dr. Harold Raymond, Bankers Trust Bldg., Des Moines, Iowa..1941
*Peasley, Mrs. Harold Raymond, 2001 Nash Dr., Des Moines, Iowa 1934

Peavey, Mrs. Leonore Gastineau, 4222 Carrollton St., Indianapolis, Indiana 1937
Peelle, Prof. Miles L., 329 Rice St., Adrian, Michigan 1940
*Peet, Dr. Max Minor, 2030 Hill St., Ann Arbor, Michigan 1935
Peil, Miss Helen, 2064 Sherwood Ave., Louisville, Kentucky 1941
Pell, S[tuyvesant] Morris, Huron Mountain Club, Marquette Co., Michigan 1938
*Pemberton, John Roy, 1244 Morada Place, Altadena, California 1922
Penner, Lawrence R., Department of Zoology, University of Connecticut, Storrs, Connecticut 1940
*Peters, Harold Seymore, R. 1, Box 171, Charleston, South Carolina 1936
*Peters, Alfred, Box 201, Brandt, South Dakota 1931
Peterson, Mrs. Charles Emil, Madison, Minnesota 1936
Peterson, Liven A[dam], Jr., 904 S. 4th Ave., Virginia, Minnesota 1940
*Peterson, Roger Tory, 1006 Fifth Ave., New York City 1942
Peterson, Mrs. Theodore, 80 Oaklawn Ave., Battle Creek, Michigan 1941
Petrides, George Athan, 1333 Fairmont St., N.W., Washington, D.C. 1942
*Pettingill, Dr. Olin Sewall, Jr., Department of Zoology, Carleton College, Northfield, Minnesota 1930
**Phelps, William H[enry], Apartado 2009, Caracas, Venezuela 1940
**Philipp, Frederick B., 152 Main St., Eatontown, New Jersey 1940
*Phillips, Alan Robert, 113 Olive Rd., Tucson, Arizona 1934
*Pickwell, Dr. Gayle Benjamin, San Jose State Teachers College, San Jose, California 1923
*Pierce, Robert Allen, Nashua, Iowa 1941
*Pirnie, Dr. Miles David, W. K. Kellogg Bird Sanctuary, Michigan State College, Augusta, Michigan 1928
Pitelka, Frank Alois, Museum of Vertebrate Zoology, University of California, Berkeley, California 1938
Plath, Karl, 2847 Giddings St., Chicago, Illinois 1942
Plattes, Cyril William, 392 Woodlawn Ave., St. Paul, Minnesota 1940
Playman, Mrs. H. L., 217 N. Union St., Appleton, Wisconsin 1941
Poncy, Robert, Rue Lachenal, 19, Geneva, Switzerland 1939
**Poole, Cecil A., 830 Chapman St., San Jose, California 1942
*Poor, Hustace Hubbard, 112 Park Ave., Yonkers, New York 1935
Porter, Miss Helen, 1440 S. 80th St., West Allis, Wisconsin 1942
Porter, Thomas Wayne, 307 S. Lansing St., Mt. Pleasant, Michigan 1938
*Potter, Julian Kent, 437 Park Ave., Collingswood, New Jersey 1915
Pough, Miss Marian F., 4 Lenox Place, St. Louis, Missouri 1942
*Pough, Richard Hooper, 33 Highbrook Ave., Pelham, New York 1938
Prather, Millard F[illmore], 912 McMillan Ave., W.E., Apt. H, Birmingham, Alabama 1940
*Preble, Edward Alexander, 3027 Newark St., Washington, D.C. 1929
*Presnall, Mrs. Clifford Charles, 5315 Earlston Dr., Washington, D.C. 1930
*Prill, Dr. Albert G., Main St., Scio, Oregon 1933
**Procter, William, Bar Harbor, Maine 1937
*Pueschel, Paul, 520 Drexel Ave., Glencoe, Illinois 1939
Putnam, Loren Smith, Stone Laboratory, Put-in-Bay, Ohio 1942
Quay, Thomas L[arelle], Department of Zoology, North Carolina State College, Raleigh, North Carolina 1939
*Quillian, Marvin C., Wesleyan College, Macon, Georgia 1927
Quimby, Don C., 4742 Garfield Ave., S., Minneapolis, Minnesota 1942
Ragusin, Anthony Vincent, Box 496, Biloxi, Mississippi 1937
Rahe, Carl W., 4666 Turney Rd., Cleveland, Ohio 1931
Ramon, Aveledo H., San Vincente a Callejon Mercedes No. 13, Caracas, Venezuela 1942

Ramsden, Dr. Charles Theodore, 8 & 19, Vista Alegre, Santiago de Cuba, Cuba 1914
Rapp, William F[rederick], Jr., 130 Washington Ave., Chatham, New Jersey 1941
Read, J. Spencer, 366 Union St., Springfield, Massachusetts 1942
*Rebmann, G. Ruhland, Jr., 7007 Hampden Lane, Edgemoor, Bethesda, Maryland 1941
Reed, Mrs. Carlos Isaac, 448 S. Villa Ave., Oak Park, Illinois 1937
Reed, Miss Willie Ruth, R. 1, Greenville, Tennessee 1939
*Reeder, Miss Clara Maude, 1608 College Ave., Houghton, Michigan....1938
*Reese, Mrs. Hans H., Circle Close, Shorewood Hills, Madison, Wisconsin.1941
Rett, Egmont Z[achary], Museum of Natural History, Santa Barbara, California 1940
Rice, Mrs. Harry Wilson, 3940 Richfield Rd., Minneapolis, Minnesota...1940
Rich, Dr. Guy C., 1820 El Cerrito Place, Hollywood, California 1914
Richards, Tudor, Joy's Lane, Groton, Massachusetts 1941
*Richey, Miss Leila Geraldine, Diamond, Pennsylvania 1942
*Ricks, Jesse J., 30 E. 42nd St., New York City 1931
Riner, Miss Alice, 503 S. Millwood, Wichita, Kansas 1939
**Rix, Malcolm W., 1087 Waverly Place, Schenectady, New York 1942
*Roads, Miss Myra Katie, 463 Vine St., Hillsboro, Ohio 1914
Robbins, Chandler S[eymour], Box 67, Ashburnham, Massachusetts 1941
Robbins, Samuel Dowse, Jr., 422 N. Murray St., Madison, Wisconsin....1941
**Roberts, Dr. Thomas Sadler, Museum of Natural History, University of Minnesota, Minneapolis, Minnesota 1914
Robertson, William Beckwith, Jr., Box 85, Berlin, Illinois 1942
***Rogers, Charles Henry, Princeton Museum of Zoology, Princeton, New Jersey 1903
Rogers, H. C., Glasgow, Kentucky 1941
Rogers, Irl, 402 Alturas Ave., Modesto, California 1937
*Rogers, Mrs. Walter E., Box 385, Appleton, Wisconsin 1931
Rollings, Clair Thomas, Division of Game Research, 319 Commerce Bldg., St. Paul, Minnesota 1940
*Rollo, Mrs. W. E., Otis Rd., Barrington, Illinois 1942
Root, Oscar M[itchell], Brooks School, North Andover, Massachusetts...1940
Rorimer, Mrs. Irene Turk [Mrs. J. M.], Suite 415, 4707 Connecticut Ave., Washington, D.C. 1938
Rosene, Walter Melvin, 1210 Jupiter, Gadsden, Alabama 1923
*Rosewall, Dr. Oscar Waldemar, Department of Zoology, Louisiana State University, University, Louisiana 1931
Ross, C. Chandler, 7924 Lincoln Dr., Chestnut Hill, Philadelphia, Pennsylvania 1937
Rowan, Dr. William, University of Alberta, Edmonton, Alberta, Canada 1939
Rowland, Miss Caroline, 276 Chestnut Ave., N.E., Warren, Ohio 1942
Ruccker, Mrs. Otto, Seapowet Farm, Tiverton, Rhode Island 1941
Ruckman, Fred S., 2735 Oakwood Drive, Cuyahoga Falls, Ohio 1941
Rudd, R. L., 345 West St., Salinas, California 1939
Russell, Dr. Whitfield Leggett, Box 22, Rhome, Texas 1935
*Rust, Henry Judson, Box 683, Coeur d'Alene, Idaho 1921
*Rysgaard, George Nielson, Minnesota Museum of Natural History, University of Minnesota, Minneapolis, Minnesota 1937
*Satterthwait, Mrs. Elizabeth Allen, 806 W. Ohio St., Urbana, Illinois....1925
Saugstad, N[els] Stanley, 717 10th St., Bismarck, North Dakota 1939
*Saunders, Aretas Andrews, 361 Crestwood Rd., Fairfield, Connecticut....1934
*Saunders, Dr. George Bradford, Fish and Wildlife Service, 1623 N.W. Washington St., Brownsville, Texas 1926

*Saunders, William Edwin, 352 Clarence St., London, Ontario, Canada....1902
*Savage, James, Buffalo Athletic Club, Buffalo, New York 1939
Sawyer, Miss Dorothy, Unadilla, New York 1937
Saylor, Lawrence W[ebster], Fish and Wildlife Service, Washington, D.C..1940
*Schantz, William Edward, 1532 Aberdeen Ave., Columbus, Ohio 1938
Schaub, Mrs. Mary Hall, [Mrs. J. B.], 1040 Isabella St., Wilmette, Illinois.1939
Schlenker, Miss Lydia, 410 Floyd St., Toledo, Ohio 1937
*Schneider, Miss Evelyn, 2207 Alta Ave., Louisville, Kentucky.....1935
*Schorger, Dr. Arlie William, 168 N. Prospect Ave., Madison, Wisconsin...1927
Schroeder, Miss Clara, 479 W. Palmer St., Detroit, Michigan 1937
*Schuette, Chal, 1446 Beaver Rd., Sewickley, Pennsylvania 1942
Schultz, Miss Helen Homes, Box 105, Mary Washington College, Fredericksburg, Virginia 1929
Schutz, Miss Clara I[rene], 277 Park Place, Meadville, Pennsylvania....1941
Scotland, Dr. Minnie Brink, 42 Continental Ave., Cohoes, New York ...1938
Scott, David Maxwell, 3615 Prud'homme Ave., Apt. 11, Montreal, Quebec, Canada 1937
Scott, Thomas George, Department of Zoology, Science Bldg., Ames, Iowa 1936
Scott, Walter Edwin, Wisconsin Conservation Department, Madison, Wisconsin 1938
Sehl, Robert Henry, 7164 Uber St., Philadelphia, Pennsylvania 1942
Seibert, Henri, 204 Vivarium Bldg., University of Illinois, Champaign, Illinois 1941
Sellers, Miss Mary Hopkins, 1612 Noble Ave., Springfield, Illinois 1942
Serbousek, Miss Lillian, 1226 2nd St., S.W., Cedar Rapids, Iowa 1935
*Shaffer, Chester Monroe, Dorcas, West Virginia 1934
Sharp, Dr. Ward M., Valentine Lakes Waterfowl Refuge, Valentine, Nebraska 1936
Sharritt, Mrs. Grace V[ivian], 13533 Roselawn Ave., Detroit, Michigan..1941
Shaver, Jess M., George Peabody College for Teachers, Nashville, Tennessee 1922
Shaw, Dr. Charles H[icks], Bremen, Ohio 1941
**Shearer, Dr. Amon Robert, Mont Belvieu, Chambers Co., Texas 1893
*Shelar, Keller, State Teachers College, Slippery Rock, Pennsylvania 1940
*Shelford, Dr. Victor Ernest, Vivarium Bldg., University of Illinois, Champaign, Illinois 1931
Shepherst, J. Max, 504 River Rd., Maumee, Ohio 1941
Sheppard, Roy Watson, 1805 Mouland Ave., Niagara Falls, Ontario, Canada 1933
****Sherman, Miss Althea Rosina, National, via McGregor, Iowa 1902
Sherwood, John Willits, R. 2, Box 150, Salinas, California 1936
Shirling, Prof. Albert Elwood, 3849 E. 62nd St., Kansas City, Missouri ..1941
Short, [Hubert] Wayne, 1207 N. 7th St., St. Louis, Missouri 1941
Shortt, A. H., 762 Garfield St., Winnipeg, Manitoba, Canada 1942
Shortt, Terence Michael, Royal Ontario Museum of Zoology, Toronto, Ontario, Canada 1941
Sibley, Charles G., 2939 Dwight Way, Berkeley, California 1942
*Silliman, Oscar Perry, 225 W. Alesas St., Salinas, California 1939
Sime, P. R., 2427 26th St., Lubbock, Texas 1939
***Simmons, Edward McIlhenny, Avery Island, Louisiana 1942
Sims, Harold L., 714 St. Philip St., Thibodaux, Louisiana 1942
Skaggs, Merit Bryan, Julian Rd., South Euclid, Ohio 1934
Slack, Miss Mabel, 1004 Everett Ave., Louisville, Kentucky 1934
Slagle, Elmer Charles, 115 Court House, Duluth, Minnesota 1941
Slawson, Miss Celeste, Johnson Public Library, Hackensack, New Jersey..1942

Slipp, John W., Botany Department, University of Washington, Seattle, Washington 1942
*Smith, Dr. Arthur Francis, Manning, Iowa 1934
*Smith, Prof. Frank R, R. 2, Box 100, Laurel, Maryland 1910
Smith, Miss Gwendolyn B., 3920 Texas St., San Diego, California 1942
*Smith, Harry Madison, Whitman Laboratory of Experimental Zoology, University of Chicago, Chicago, Illinois 1936
Smith, J. Donald, White Bear Lake, Minnesota 1939
*Smith, Lewis MacCuen, 8040 St. Martins Lane, Chestnut Hill, Philadelphia, Pennsylvania 1931
Smith, Luther Ely, 1554 Telephone Bldg., 1010 Pine St., St. Louis, Missouri 1941
Smith, Orion O., 1539 Crosby St., Rockford, Illinois 1936
Smith, Philip E., 604 S. 6th St., Champaign, Illinois 1942
*Smith, Roy Harmon, 183 N. Prospect St., Kent, Ohio 1936
Smith, Thomas [Price], Osage Ave., Anchorage, Kentucky 1941
Smith, Wendell Phillips, Wells River, Vermont 1921
Snapp, Mrs. Edith, 310 W. Michigan, Urbana, Illinois 1940
Snyder, Lester Lynne, Royal Ontario Museum of Zoology, Toronto 5, Ontario, Canada 1929
Snyder, Richard Craine, 431 Clark St., South Orange, New Jersey 1940
Sooter, Clarence Andrew, Malheur National Wildlife Refuge, Burns, Oregon 1940
Soper, J[oseph] Dewey, 827 Riverwood Ave., Fort Garry, Winnipeg, Manitoba, Canada 1937
Spangler, Miss Iva M., 128 E. Foster Parkway, Fort Wayne, Indiana 1939
Spawn, Gerald B., South Dakota State College, Brookings, South Dakota.1941
Spear, Ivan MacDonald, 39 West Elm St., Yarmouth, Maine 1942
*Speirs, Mrs. Doris Hustis, Ancaster, Ontario, Canada 1936
Speirs, John Murray, Ancaster, Ontario, Canada 1931
Spencer, Miss O. Ruth, 1030 25 Avenue Court, Moline, Illinois 1938
Sperry, Charles Carlisle, 1455 S. Franklin St., Denver, Colorado 1931
Spofford, Walter Richardson II, Vanderbilt University Medical School, Nashville, Tennessee 1942
Stabler, Robert M[iller], Glen Mills, Pennsylvania 1939
Stacey, J[ohn] W[illiam], 236 Flood Bldg., San Francisco, California ..1940
Stackpole, Richard, 292 Beacon St., Boston, Massachusetts 1940
Staebler, Arthur Eugene, R. 5, Box 252, Ann Arbor, Michigan 1937
**Stahl, Miss Marjoretta Jean, Kimberly, West Virginia 1942
Stanford, Jack A[rchibald], 1900 North Circle Dr., Jefferson City, Missouri 1941
Stanley, Allan J., Louisiana State University, University, Louisiana 1941
Stark, Miss Wilma R[uth], 1701 16th St., N.W., Washington, D. C. 1939
Starrett, William Charles, 5432 N. Campbell Ave., Chicago, Illinois 1933
*Stebbins, Miss Fannie Adell, 31 Ely Ave., West Springfield, Massachusetts 1935
Steggerda, Dr. Morris, Department of Genetics, Carnegie Institution of Washington, Cold Spring Harbor, Long Island, New York 1941
Stephens, Dr. Thomas Calderwood, Morningside College, Sioux City, Iowa 1911
*Stevens, O. A., State College Station, Fargo, North Dakota....1926
Stevenson H[orace] Godwin, Jr., 7318 Bryan St., Mt. Airy, Philadelphia, Pennsylvania 1939
*Stewart, Paul Alva, Leetonia, Ohio 1925
Stewart, Robert Earl, Patuxent Research Refuge, Bowie, Maryland....1939
*Stickney, Mrs. Albert, Jr., 350 E. 52nd St., New York City....1935

*Stillwell, Jerry E., 7460 San Benito Way, R. 4, Dallas, Texas 1935
**Stoddard, Herbert Lee, R. 5, Sherwood Plantation, Thomasville, Georgia..1916
Stone, Harry H[erbert], Jr., Box 101, Sturbridge, Massachusetts 1941
*Stoner, Dr. Dayton, New York State Museum, Albany, New York 1912
Stophlet, John Jermain, 2612 Maplewood Ave., Toledo, Ohio 1934
Storer, John Humphreys, 579 Beaver St., Waltham, Massachusetts 1939
*Storer, Dr. Tracy Irwin, Division of Zoology, University of California, Davis, California 1928
Stoudt, Jerome H., 209 N. Mill St., Waupun, Wisconsin 1941
Street, Thomas M., Bottineau, North Dakota 1940
Strehlow, Elmer William, 721 W. Mason St., Green Bay, Wisconsin 1941
Stringham, Dr. Emerson, Box 94, Madison, Wisconsin 1940
****Strong, Dr. Reuben Myron, 5840 Stoney Island Ave., Chicago, Illinois .....Founder
Struck, Dr. Kuno Herbert, 1003 First National Bank Bldg., Davenport, Iowa 1942
Stullken, Donald Edward, 5464 W. Walton St., Chicago, Illinois 1941
***Sturgeon, Myron T., Michigan State Normal College, Ypsilanti, Michigan.1934
Sturgis, S. Warren, 66 Marlboro St., Boston, Massachusetts 1941
*Sumner, Eustace Lowell, Sr., 2537 Rose Walk, Berkeley, California.....1931
*Suthard, James Gregory, 1881 Raymond Ave., Long Beach, California....1936
**Sutton, Dr. George Miksch, Laboratory of Ornithology, Fernow Hall, Cornell University, Ithaca, New York 1920
*Swanson, Dr. Gustav [Adolph], Division of Economic Zoology, University of Minnesota, University Farm, St. Paul, Minnesota 1927
*Swedenborg, Ernie David, 4905 Vincent Ave., S., Minneapolis, Minnesota.1929
Tabor, Miss Ava Rogers, 305 Canal Blvd., Thibodaux, Louisiana 1940
Tallman, William S[weet], Jr., 4 Linden Place, Sewickley, Pennsylvania..1940
Tanner, James T., 16½ N. Church St., Cortland, New York.....1937
*Taverner, Percy Algernon, 45 Leonard Ave., Ottawa, Ontario, Canada...1905
*Taylor, Dr. Aravilla Meek, Lake Erie College, Painesville, Ohio 1936
***Taylor, Dr. Arthur Chandler, Irving Zuelke Bldg., Appleton, Wisconsin..1929
Taylor, Miss Joanne, 1176 Shattuck, Berkeley, California 1941
***Taylor, Mrs. Rose Schuster, 900 Santa Barbara Rd., Berkeley, California.1916
*Taylor, Walter Penn, 254 Faculty Exchange, College Station, Texas.....1937
Taylor, William Ralph, Museum of Vertebrate Paleontology, University of Kansas, Lawrence, Kansas 1940
*Teachenor, Dix, 1020 W. 61st St., Kansas City, Missouri 1923
Temple, Mrs. Edward H., Box 118, North Woodstock, New Hampshire..1942
Terres, J[ohn] Kenneth, 103 E. Third St., Watkins Glen, New York....1939
Thatcher, S. Charles, 2918 Brownsboro Rd., Louisville, Kentucky 1942
*Thacker, Miss Maxine, Branchland, West Virginia 1941
*Thomas, Edward Sinclair, 319 Acton Rd., Columbus, Ohio 1921
*Thomas, Judge Otho S., 205 S. Greene St., Rock Rapids, Iowa 1932
*Thomas, Mrs. Rowland, R. 3, North Little Rock, Arkansas 1937
*Thornton, William James, Box 1011, Birmingham, Alabama 1940
***Thorp, George Boulton, Scattergood Hostel, West Branch, Iowa 1935
*Tinker, Almerin David, R. 1, Chelsea, Michigan 1909
Tipton, Dr. Samuel R[idley], 212 Marlborough St., Detroit, Michigan....1941
Todd, Mrs. Elizabeth D., 918 W. Main St., Kalamazoo, Michigan.....1939
Todd, Henry Oliver, Jr., Woodbury Rd., Murfreesboro, Tennessee.....1938
**Todd, W[alter] E[dmond] Clyde, Carnegie Museum, Pittsburgh, Pennsylvania 1911
*Tomkins, Ivan Rexford, U. S. Dredge Morgan, Savannah, Georgia.....1931
Toner, George C., 63 Lowther Ave., Toronto, Ontario, Canada 1939
Tonkin, George, 1140 Park Square Bldg., Boston, Massachusetts 1935

*Trautman, Milton Bernhard, Stone Laboratory, Put-in-Bay, Ohio 1932
Travis, Bernard V., Box 655, New Smyrna Beach, Florida 1935
Tryon, Clarence Archer, Jr., Zoology Department, Montana State College, Bozeman, Montana 1942
*Tubbs, Farley F., Game Division, Department of Conservation, Lansing, Michigan 1935
***Tucker, Mrs. Carll, Penwood, Mount Kisco, New York 1928
Tucker, Edward R., 245 N. Auburndale, Memphis, Tennessee 1942
*Turner, Miss Ruth D[ixon], 163 Forest St., Melrose, Massachusetts.....1939
Tuttle, George Mott, Jr., River Rd., Youngstown, New York 1940
Tvedt, Harold B[loom], 60 Chittenden, Columbus, Ohio 1941
*Twomey, Dr. Arthur Cornelius, Carnegie Museum, Pittsburgh, Pennsylvania 1936
*Tyler, Dr. Winsor Marrett, 1482 Commonwealth Ave., Brighton, Massachusetts 1914
*Uhler, Francis Morey, Patuxent Research Refuge, Bowie, Maryland 1931
**Uhrig, Mrs. A. B., Box 28, Oconomowoc, Wisconsin 1926
Umbach, Miss Margaret, 2526 East Dr., Fort Wayne, Indiana 1941
Uttal, Leonard Jordan, 225 S. Western, Enid, Oklahoma 1940
*Vaiden, Meredith Gordon, Rosedale, Mississippi 1937
Van Coevering, Jack, 9816 Ingram-Rosedale Gardens, Plymouth, Michigan 1939
**Vandervort, Charles Champion, Laceyville, Pennsylvania 1937
Vaniman, Mrs. Vernon, 408 W. Iowa St., Urbana, Illinois 1941
*Van Rossem, A. J., 2205 West Adams St., Los Angeles, California.....1939
**Van Tyne, Mrs. C. H., 484 Gordon Rd., Ridgewood, New Jersey.....1939
***Van Tyne, Dr. Josselyn, Museum of Zoology, Ann Arbor, Michigan....1922
Vaughan, William Coleman, 213 Raymond St., Chevy Chase, Maryland...1938
Velich, Ralph W., Nebraska State Museum, University of Nebraska, Lincoln, Nebraska 1941
Vesall, David Bernard, Stillwater, Minnesota 1940
*Visscher, Dr. Paul, Biology Laboratory, Western Reserve University, Cleveland, Ohio 1924
*Vogt, William, % Mrs. F. V. Brown, 32 Cunningham Ave., Floral Park, New York 1935
*Vollmar, Mrs. Joseph E., 6138 Simpson Ave., St. Louis, Missouri 1941
von Bloeker, Jack C[hristian], Jr., 1625 Country Club Drive, Glendale, California 1940
Wade, Douglas E., Department of Zoology, University of Missouri, Columbia, Missouri 1936
Wagner, Esther E., 13 Locust Ave., Danbury, Connecticut 1937
*Wagner, Fritz, Jr., 384 Hawthorne Lane, Winnetka, Illinois 1938
*Walker, Dr. Charles Frederic, Stone Laboratory, Put-in-Bay, Ohio.....1939
*Walkinshaw, Dr. Lawrence Harvey, 1416½ W. Michigan Ave., Battle Creek, Michigan 1928
Wallace, George John, Zoology Department, Michigan State College, East Lansing, Michigan 1937
Wallace, Harold Eugene, 401 N. Trenton St., Ruston, Louisiana 1942
Wallner, Alfred, 111 Roby Rd., Madison, Wisconsin 1941
Wanless, Dr. Harold R[ollin], 704 S. McCullough St., Urbana, Illinois..1940
Warner, Mrs. Carmen Hambleton, 117 W. Hubbard Ave., Columbus, Ohio.1939
Watson, Frank Graham, 2418 Chestnut Ave., Long Beach, California....1937
Watson, Lucius H., 4013 Sheridan Blvd., Lincoln, Nebraska 1925
*Weaver, Dr. Richard Lee, University of New Hampshire, Durham, New Hampshire 1936
Weber, Edmund P., 95 Ingram Ave., Pgh. No. 5, Ingram, Pennsylvania...1942

Weber, Louis, M[arkus], 2713 Dodier St., St. Louis, Missouri 1941
*Weber, Orlando Franklin, Jr., Mt. Kisco, New York 1936
Webster, J[ackson] Dan, Biology Department, Rice Institute, Houston, Texas 1939
Weingart, Vernon Rolland, R. 1, Kent, Ohio 1942
Welles, Mrs. Mary Pyke, R. 2, Ossining, New York 1938
Wessel, John P., Wright City Junior College, 3400 Austin Ave., Chicago, Illinois 1941
West, Russell, 113 Edgewood St., Wheeling, West Virginia 1941
*Wester, Russell William, 112 Prospect St., Nutley, New Jersey 1942
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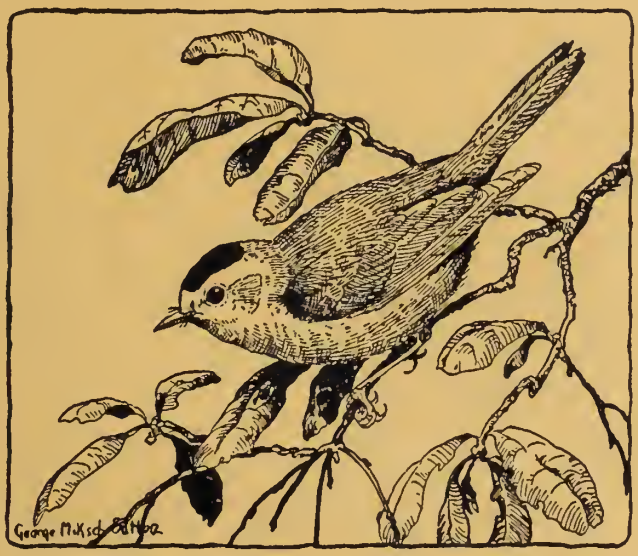

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Ann Arbor, Michigan

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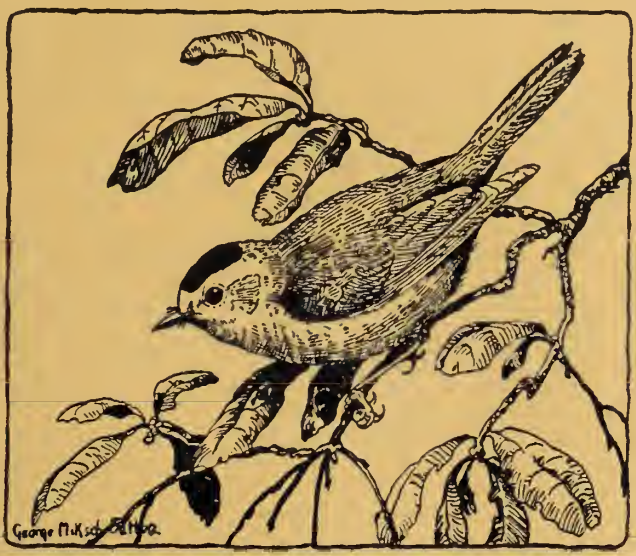

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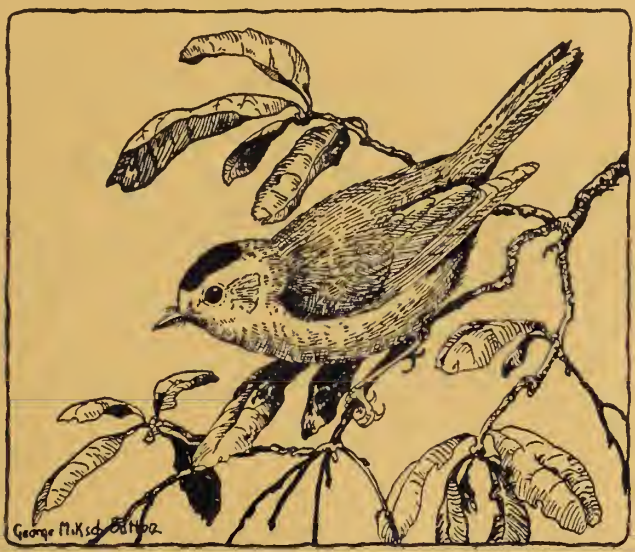

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MANUSCRIPT. Manuscripts should be typed on paper of good quality and of letter size (8½ x 11). Write on one side only and use double spacing. The title should be brief and carefully constructed so as to indicate clearly the subject. Ordinarily the scientific names of the birds treated should be given and should appear early in the article. Most articles should have a brief summary at the end.

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1914—Chicago	February 5	T. C. Stephens
1914—Chicago	December 29-30	T. C. Stephens
1915—Columbus	December 28-29	T. C. Stephens
1916—Chicago	December 27-28	T. C. Stephens
1918—Pittsburgh	January 1-2	W. F. Henninger
1919—St. Louis	December 29-30	M. H. Swenk
1920—Chicago	December 27-28	R. M. Strong
1921—Chicago	December 26-27	R. M. Strong
1922—Chicago	October 24	T. L. Hankinson
1923—Cincinnati	Dec. 31-Jan. 1, 1924	T. L. Hankinson
1924—Nashville	November 28-30	A. F. Ganier
1925—Kansas City	December 28-29	A. F. Ganier
1926—Chicago	November 26-27	A. F. Ganier
1927—Nashville	Dec. 30-Jan. 1, 1928	Lynds Jones
1928—Ann Arbor	Nov. 30-Dec. 1	Lynds Jones
1929—Des Moines	December 27-28	Lynds Jones
1930—Cleveland	December 29-30	J. W. Stack
1931—New Orleans	December 28-29	J. W. Stack
1932—Columbus	November 25-26	J. M. Shaver
1934—Pittsburgh	December 28-29	J. M. Shaver
1935—St. Louis	December 30-31	J. Van Tyne
1936—Chicago	November 27-28	J. Van Tyne
1937—Indianapolis	December 27-28	J. Van Tyne
1938—Ann Arbor	November 25-26	M. M. Nice
1939—Louisville	November 24-25	M. M. Nice
1940—Minneapolis	November 22-23	L. E. Hicks
1941—Urbana	November 20-23	L. E. Hicks

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